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DEVOTED EXCLUSIVELY TO METALLIC SURFACE TREATMENTS

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DEVOTED EXCLUSIVELY TO METALLIC SURFACE TREATMENTS

METAL FINISHING

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A Challenge

Many of the 1947 automobiles are featuring more stainless-steel exterior trim than ever before. Although, in the past, stainless has been used on cars to some extent, there seems to have been a reluctance on the part of manufacturers to present both chromium and stainless-steel finishes on different exterior-trim parts of the same automobile. Now, with new cars in great demand, it appears that the producers have seen fit to give the public the mixed finishes. It is reliably reported that at least two of the leading manufacturers will feature stainless steel bumpers on their 1948 models. Perhaps the public is ready to accept stainless-steel trim (even though it does discolor and rust) after seeing the deterioration of the skimped, war-restricted plating jobs on some 1942 models. How many more car makers will turn to stainless in their 1948 offerings? How much more extensively will stainless be used in other industries in decorative trim? Is not the replacement of plated ware by stainless steel a serious challenge to the electroplaters?

Because of the steel shortage, anodized aluminum may also appear in the form of automobile hardware. Although electrolytic processes may be used in finishing aluminum alloys, what about electroplating?

Acquiescent platers may say that the use of stainless steel will undoubtedly throw emphasis on electropolishing, which is still an electrolytic process and that therefor the electroplating industry has not lost out. Chromium plating (including the base coatings of copper and nickel) of automobile bumpers, grilles, louvers, headlights, hub caps, grille-guards, etc., is a big business. Competitively, replacement materials have entered the field and threaten chromium-plated trim finishes. Platers, what are you going to do about it?

Some of the more important requirements of exterior trim, from one point of view, are gleaming brilliance and corrosion resistance both for appearance and wear, hardness for practicability, and durability for the time that the car is expected to last (years—not 90 days, the extent of a new-car guarantee!) It is unfortunate, but true, that the average car owner does not take care of the bright trim on his car in the same manner that he attempts to preserve the painted body finish. Cleaning and waxing seem to stop at the trim; car owners appear to be of the opinion that the grille, bumpers, etc., should stay shiny and in good condition without their exercising any protective maintenance. This situation adds problems for the platers and for the users of stainless as well.

Thus we have one of the largest and most important markets for plated ware showing favor toward trim materials other than chromium plate. Will thicker nickel-base coatings and better process control be sufficient to maintain the position of chromium finishes in the automotive field?

ELECTROPLATERS, WHAT WILL BE YOUR RESPONSE
TO THIS IMMINENT CHALLENGE?

An ideal set-up room. Note cleanliness, convenience and system of layout.

Modern Mechanical Surface Finishing

By Martin Manler, *Lakewood, Ohio.*

THE term of "mechanical surface finishing" is simply a new name for an operation or a series of fabricating operations that goes back many years. It is a descriptive phrase that covers buffing, polishing, burring, grinding, etc.

The term is one that keeps cropping up in present-day technical literature with regularity and is thus rapidly gaining more extensive acceptance and recognition. It arouses interest among finishing executives bent upon keeping abreast of all the latest technical advances and developments in the highly specialized and skilled practices of metal fabrication. Much has been said and written in recent years about these fabricating procedures, particularly buffing, polishing and grinding. This is due, basically, to the significant fact that these operations are used on metals and non-metallic materials of such great variety and are involved in the manufacture of almost every article produced by American industry.

With the demand for production of long-scarce, vitally-needed peacetime products now comprising industry's order of the day, mechanical surface finishing occupies a place of major importance in the nation's manufacturing plants. It plays a role as significant to this peace era as it was to the war period.

Finishing departments of many factories are not only being expanded and modernized, but they are also getting an influx of new, comparatively inexperienced personnel. Since buffing, polishing, grinding, etc., are key operations in the peace-prosperity production program, thousands of such workers are being broken into all kinds of mechanical finishing tasks. A review of the elementary principles and essential practices of these operations will prove of timely interest and constructive value.

Polishing and Buffing

When speaking of polishing, it would be well to define the term clearly so that we know exactly what we are talking about. There still exists considerable confusion as to its meaning due to the fact that it is often interchanged with buffing. However, a prominent authority gives the following distinction between them:[1]

Polishing is any operation performed with wheels having abrasive glued to the working surface. Buffing is an operation performed with wheels having the abrasive applied loosely. It is not as severe an operation as ordinary polishing and is commonly used to secure extremely fine surfaces having a "grainless" finish.

Another, and equally reliable, expert defines polishing as "that branch of grinding which employs various types of yielding or cushioned wheels and flexible belts, the surfaces of which are covered or impregnated with some sort of abrasive."[2] A polishing operation used for the removal of considerable stock, and requiring coarse abrasive grain, is known as "flexible grinding." Various grades of polishing are described as "roughing," "dry fining," "greasing" and "finishing." The degree of finish depends upon the standards set up by each plant for their operations.[3]

Buffing, on the other hand, means the practice of

producing a smooth, uniform and lustrous surface by means of a revolving flexible buff charged with buffing compound. It is usually divided into two operations called "cutting down" and "coloring."[4] In cutting down aluminum, for example, abrasive is applied to a sewed muslin wheel from a cake compounded of tripoli or other abrasives with a binder which supplies the lubricant. Coloring aluminum differs from this only in that unstitched muslin wheels are used, and the abrasive is finer.[5]

By means of these mechanical finishing procedures, the surface is freed of irregularities or imperfections produced during casting or fabrication of the metal, such as tool and die marks, parting lines, pits and deep scratches, to acquire a smooth, uniform finish or a high luster.[4,5]

In polishing, surface imperfections are removed by means of resilient polishing wheels made of a wide variety of cloth materials, felts and leathers. The polishing edge or face of the wheel is coated with animal hide glue or polishing wheel cement and is rolled in a pan of abrasive grain. The grit size of the abrasive varies from coarse to fine, depending upon the condition of the metal surface and the amount of stock to be removed. Use of factory-prepared endless-coated abrasive belts is spreading rapidly for many polishing operations previously calling for set-up wheels. Production has been increased with attractive savings in time, material and labor.[4]

For roughing operations, a coarse grit is used. The wheels or belts are used dry so that a rapid cutting action is obtained. For the finishing operations, fine grit sizes are employed and grease sticks or emery paste compounds are applied to the wheel or belt. The addition of a lubricant is frequently suggested because it produces a smoother, brighter surface and prevents loading or glazing of the wheel or belt. It prevents the work from overheating, eliminates discoloration, and greatly increased polishing wheel life.[4] Liberal lubrication has been found to be of particular importance in the case of aluminum, die-cast metals, or other low-melting alloys.

Polishing Wheels

There are many types of wheels used for production polishing today and their field of use varies widely. Each kind has special characteristics which adapt it to certain classes of work.[2] The principal materials from which polishing wheels can be made are wood, leather, canvas, cotton cloth, felt, paper, walrus or sea-horse hide, sheepskin, impregnated rubber, canvas composition and wool. Of these, leather and canvas are the materials most commonly employed in present-day polishing wheel construction.[1] Of all the types of wheels commercially available today, the following describes the more important and most widely used ones:[1,3,6]

Wooden wheels covered with leather to which emery or some other abrasive is glued are particularly suitable for flat work, especially where good edges or sharp corner outlines must be maintained. This is usually the case with such items as cutlery, small arms, brass door plates and name plates. Covered with a double coating of leather, the wooden wheel makes a first-class finishing wheel. Once universally used, its applications are now restricted to the polishing of flat surfaces.

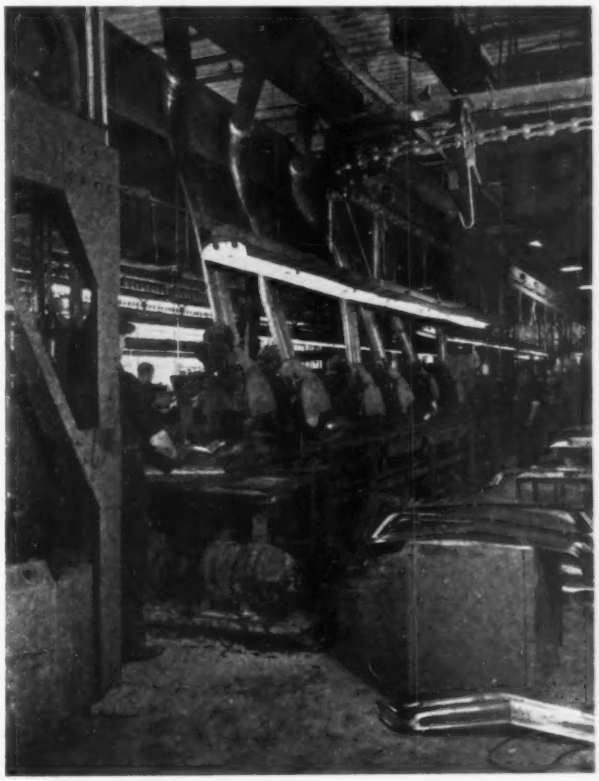
Canvas wheels are usually of two kinds of construction; glued wheels and hand-sewed wheels. Glued wheels, having discs cemented together close to the periphery, provide a hard face for rough, coarse, work. Both sides of the disc are glued to stiffen the canvas. Sewed canvas wheels, more flexible and of varying densities, are made by sewing together a number of discs into sections, which are then glued together into a solid wheel.

Flexibility of face is obtained by gluing the sections part of the way from the center to the periphery. Metal side plates to support the canvas discs are usually required on unglued wheels in which the discs are held together by sewing.

Muslin wheels are made from sewed buffs glued together with the outer edges left open or glue-free, providing an open face of any desired depth. Similarly, other types of cloth wheels are made by gluing together sections of sewed buffs, and are used for much the same class of work as the canvas wheels but are softer and more flexible.

Canvas and muslin wheels are used extensively for the polishing of brass, cast iron and steel, and have proved very satisfactory as well for roughing-out and dry-fining of irregular pieces. These two types of polishing wheel hold the abrasive well and require no washing off; they can be cleaned with a buff stick or an abrasive brick.

Wool-felt wheels, made from discs of woven felt, 3/16 to 1/4" thick, are flexible and resilient, but are



Automatic polishing line for high production.

An aluminum stew pan is polished by holding it against a rotating felt wheel.

stiffer than the cloth polishing wheels because of the thickness of the felt discs. In holding a flatter face, they have less tendency to mush or round over on the corners.

Solid-felt wheels are made from a fine grade of felt in several qualities, and when abrasive-coated, possess a yielding character but have a face that is solid and unbroken as differentiated from disc wheels. Solid-felt wheels are quite popular for fine finishing of steel or iron and certain types of brass and aluminum castings but are not generally used as general purpose wheels.

Walrus leather or sea-horse hide wheels, while expensive, are highly valuable for fine finishes. They are extensively employed in the small arms, silver and jewelry fields with the finer grades of powdered abrasives applied by moistening the abrasives and forcing them into the pores or fibers of the leather. The walrus leather wheel is best known to the general polishing trade in the form of "bobs" for internal work.

Bullneck wheels, made of oak tanned bullneck leather cut into uniformly thick discs are softer, spongier and have a more open grain than those made from back leather. The hardness and quality of leather wheels can be varied through the use of leathers of different thicknesses, with thick discs making softer wheels than thin discs.

Sheepskin wheels, made by cementing or sewing together sheepskin discs, are used widely in fine finishing of "soft" metals and alloys as well as small brass and stainless steel parts fabricated from sheet stock. Cemented wheels are very soft, but sewed wheels are even softer.

The compress wheel, generally made from rectangular pieces of canvas, leather, felt, paper or other materials compressed by two metal side plates attached to the wheel hub to form a ring or cushion, is a suitable type for irregular shaped work.

This ring or cushion of polishing material may be varied in density or flexibility (generally described as hard, medium and soft) to suit individual requirements. It may be shaped readily to conform to the curvature of the work. This shape can be maintained. Widely employed in the cutlery and small tools industries, the compress wheel has proved an effective all-purpose wheel for all kinds of metal where it is necessary to hold the shape, corners, and edges of the polished article.

Below is given a list of wheels and the types of work they are used for:[7]

Wood—Steel strip, cutlery, for beveling and edging.

Canvas—Copper alloys, aluminum, copper and zinc alloy castings, steel forgings and pressed steel parts.

Muslin—Cast iron, cast steel, cast copper alloys, steel forgings, aluminum die castings, pressed steel parts.

Felt—Iron, steel, copper and aluminum alloy castings.

Walrus Hide—Bobs for holloware, finishing of high carbon steel strip or sheet.

Bullneck Leather—Dry and grease fining, cast iron, steel forgings, brass castings.

Compress—Used for all types of work; adaptable for all contour polishing.

Abrasive Grain

The abrasive grain used for polishing is of basic importance because it is the cutting or abrading medium which performs the actual work. Natural abrasives were used almost exclusively at one time, but have been replaced in recent years by artificial abrasives of the alumina type. These have proved far superior because of their uniformly high, closely maintained percentage of crystalline alumina. This superiority becomes more apparent in the coarser grains used on operations for the removal of considerable material. Polishing wheel abrasives, as with grinding wheels, are designated by number, running from 8 to 600.[2] Abrasive numbers used for roughing ordinarily range from 60 to 80; for dry fining from 90 to 120; and for finishing from 150 to one of the "flour" grades (an abrasive finer than No. 200). These numbers represent the number of meshes per linear inch in the grading sieve. The flours are designated by the letters CF, F, FF, FFF, FFFF and PCF or SF, ranging from coarse to fine.[1]

Physical Properties of Abrasives

Abrasive grain for polishing requires eight attributes: (1) extreme hardness, (2) extreme toughness, (3) uniform chemical composition, (4) uniform crystal structure, (5) uniform grain size with minimum of oversized and undersized grain, (6) control of grain shapes to give best results under specific polishing conditions (the sharp cutting edges must be retained), (7) high capillarity to allow easy wetting with glue solutions, (8) surface treatments to give most suitable bonding strength with glue.[3]

Aluminum oxide abrasive grain manufactured by leading concerns meets these specifications. The physical characteristics of the grain (surface treatment and shape of grain), are varied according to the nature of the polishing operation. For example, a

roughing operation may require a different type of grain than a finishing operation on the same metal. Again, different metals may require different grain characteristics in all of the polishing steps from roughing on through the final operation.

Of all the requirements of abrasive for polishing, uniformity of particle size is one of the most important. Oversized grains scratch and mar the finish: Undersized grains fail to do their share of the work. Aluminum oxide abrasive made by reputable suppliers is sized to meet U. S. Department of Commerce and polishing specifications of the Abrasive Grain Association.

In the case of quality abrasive, grain shape is definitely predetermined. It is the result of a carefully planned, precisely executed series of operations that eliminate the extreme flats and slivers, leaving only the solid, sharp grains which stand up under severe work. Structural properties are controlled in the manufacture and preparation of the grain. Angularity, or sharpness, is also a feature of premium-grade grain. It is a prime factor in producing fast-cutting polishing compounds.

High capillarity of grain is an essential, for it is the one property that determines the strength or resistance to breakdown of a polishing wheel. Lacking it, the grain is difficult to wet with glue solutions, giving a poor wheel which will wear rapidly. High capillarity grains effectively soak up glue and thus make stronger wheels. First-class polishing abrasive is specially treated to raise its capillarity and so handled to maintain this capillarity. As a result, it sticks firmly to the wheel until its work is completed.

It would be well to point out here that best plant practice calls for keeping fresh clean grain in the troughs daily. This is accomplished by not allowing any to remain in the bottom. Grain capillarity is lowered when the grain is permitted to remain too long in the bottom of the set-up trough or when containers are left open, even though the air may appear clean, dry and free from oily or greasy vapors.

Selection of Proper Size Grain

Work requiring the removal of very little material may be performed with a single polishing operation. Small hand-tools or other parts, which are given a fine finish but are not plated, require roughing, dry fining, greasing and coloring, starting with the coarser and finishing with the finer grain.[1, 2]

In such instances, the abrasive selected for the initial step influences the efficiency and economy of the final operations and the final finish. If coarse grain, say No. 36, is used in the first operation, this should not be followed by a very fine grain since considerable time would be expended in removing the deep scratches made by the coarse grain. It would be better to follow No. 36 with No. 60 and then use No. 120 grain if a fine finish is required. Still finer grains could be subsequently employed if it is necessary to produce a high luster. When changing from one size to the next finer changing the direction of the strokes, if practical, will expedite scratch removal.[2]

Glue Selection and Application

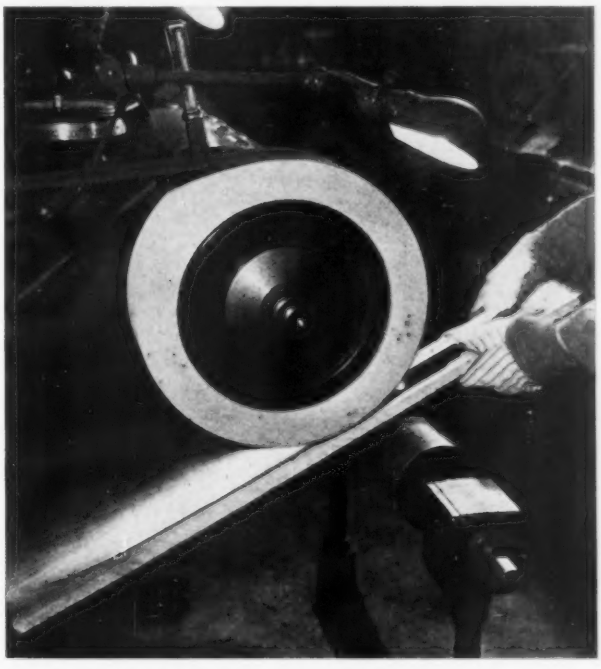
Another basic consideration in polishing concerns the proper preparation and application of glue. This point cannot be stressed and its importance rated too heavily. Such polishing room troubles as work of sub-standard quality, variable abrasive costs, irregular production rates, difficulties in maintaining standard piece rates and many other things of this nature are frequently traceable to unsatisfactory glue conditions.[2]

Use of a good grade of animal hide glue is essential. It should be mixed by weight only. Never more than a three-hour supply should be heated at one time. For average polishing room conditions, the following table of mixtures will serve as a guide for setting up wheels:[3]

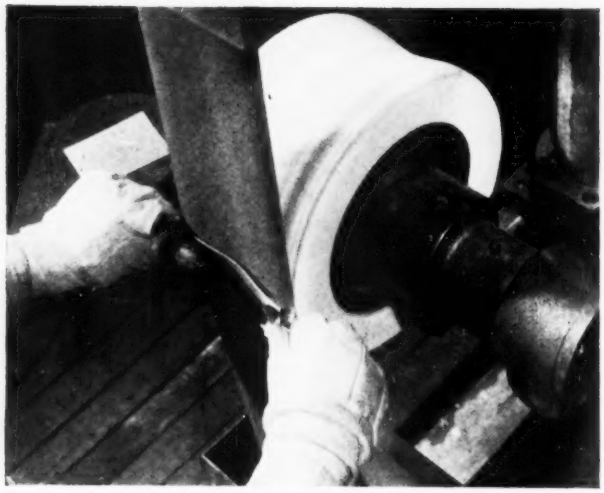
Size of Grain	% Glue	% Water
24— 36	50	50
46— 54	45	55
60— 70	40	60
80— 90	35	65
100—120	33	67
150—180	30	70
220—240	25	75

Glue should be soaked so as to dissolve more readily on heating. Cold, clean water should be used, with ground glue soaked from one to three hours, flake glue for six to eight hours, and cake glue for 12 hours or more.[2, 3] The glue should be melted in a water-jacketed heater. When the wheels and grain are preheated, the glue is applied at a temperature of 140° F. With wheels and grain at room temperature, glue is used at 160° F. A thermometer should be kept in the gluepot as a constant check on temperature, even though the pot is regulated by a thermostat. All equipment used should be kept in a clean condition.[3]

Other tips which plant experience indicates prove helpful in handling and preparing glue are:[2]



Application of belt polishing technique.



Contour polishing with backstand equipment.

Store glue in a dry, cool place.
Measure glue and water by weight.
While soaking, glue should be completely covered with water.
Use aluminum glue pots.
Keep glue pots covered.
Remove any scum that accumulates.
Stir glue while melting.
Never boil or cook glue.
Remember that bacteria spoil glue.
Use glue while fresh, preferably within four hours after heating.
Throw out any glue left exposed at night.
Glue from the day before mixed with fresh glue weakens the mixture 50 percent.
Scald pots and brushes every night.
Keep brushes not in use in a weak solution of carbolic acid.
Remove dead glue from floor, benches, tools, or whatever present.
Coarse grain requires thick glue while fine grain requires thin glue. For fine grain dilute the glue from the original mixture, according to "thinness" required.
Provide oven or preheating room for heating wheels before gluing up.
Heat wheels and abrasives to at least 120° F.
Allow plenty of time for glue to set; it does not attain its maximum strength in less than 48 hours.

Polishing Wheel Cements

The use of cements to set up polishing wheels has increased substantially in recent years, so that in many cases it has been a battle of animal hide glue vs. cement, with considerable grounds for dispute as to the relative superiority. In all fairness to cement manufacturers, their side of the story bears brief telling.

One leading polishing wheel cement producer asserts that cement-prepared wheels will produce more work and last from two to six times as long as wheels set up with animal hide glue. The frictional heat created during polishing wheel operations softens glue coatings, allowing the abrasive grain to be torn loose from the wheel face before it can perform utmost efficiently. The cement bond is claimed to be unaffected by this frictional heat, and therefore, not softened by it. The abrasive grain is said to be firmly anchored to the surface, permitting it to cut and break down in size until completely consumed.[4] Other advantages claimed for such a cement are: smaller wheel inventories, more work produced from each set-up wheel, fewer coats needed, and quicker return of wheels to service. A quality wheel cement reportedly air-dries overnight. The drying time can be reduced to a matter of a few hours by force-drying in an oven at temperatures from 150° F. to 200° F.[4]

One authority says that the general practices today speak for themselves. For rough work from 36 to 100 abrasive, the cement operates more economically and with better results, but, from 120 to the F grades of abrasive, the glue gives better finishes. To use both in a job shop may not be satisfactory unless there is a considerable amount of rough work. The large plant has found that it pays where the coarser abrasives are used.[8]

(To be concluded next month)

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Electroplating on Aluminum

(Preparation by Zinc Immersion Process)

By Myron B. Diggin, *Technical Director, Hanson-Van Winkle-Munning Company, Matawan, N. J.*

THE zinc immersion process for the preparation of aluminum for plating has been used to a limited extent for many years; in fact, some improvement patents on this process are old enough to have expired. This method is applicable to both wrought and cast aluminum alloys. It appears to be less critical than the oxalic or phosphoric anodize methods; furthermore, it does not interpose an electrically resistant layer between the aluminum base and subsequently applied deposits.

Surface Preparation Cycle

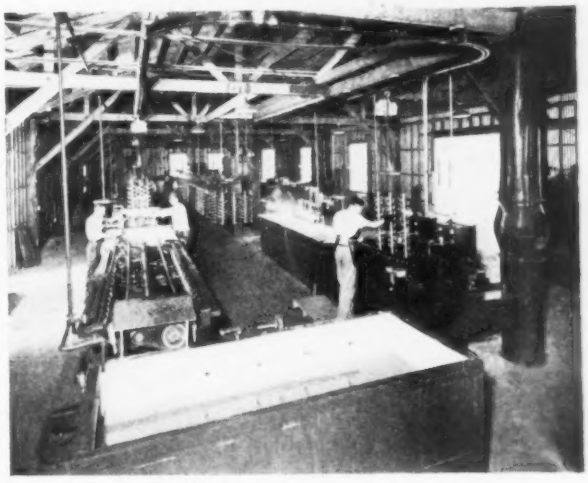
After the aluminum to be plated is suitably cleaned, it is immersed in a solution of sodium hydroxide and zinc oxide (the interaction of the chemicals forming sodium zincate.) In this solution a thin surface layer of aluminum is replaced by zinc from the solution. A very adherent and continuous deposit of zinc is formed to a thickness of about 0.0000025 inch.

After the thin zinc film is formed, the articles are first given a strike in a Rochelle copper solution operated at 105° F. ± 50 with the pH adjusted to 9.6. They are then plated in either a Rochelle copper solution operated under standard conditions or in a bright copper bath such as the amine copper solution. The amine bath is well-suited to this application because the normal operating pH is around 9.5. Other metals may be deposited over the copper coating.

The Aluminum Company of America in its publication "Electroplating on Aluminum and its Alloys" suggests the following sequence of operations for (I) Wrought Alloys, (II) Cast Alloys, (III) High Silicon casting alloys (Alcoa No. 13)

I. Wrought alloys
   1. Clean
      If articles are heavily oiled, the use of an organic solvent vapor degreaser is recommended. After degreasing, the parts are cleaned by immersion in an inhibited alkaline cleaner.
   2. Water rinse
   3. Chromic acid-sulphuric acid pickle
      Chromic acid—5 oz./gal.
      Sulphuric acid—24 oz./gal. (0.1 gal. 66° Be H_2SO_4 per gal.)
      Time —1-5 minutes
      Temp.—150° F.
      Tank —Lead lined, exhaust casings
   4. Water rinse
   5.[1] Nitric acid dip, conc. commercial
      Time —10-15 sec.
      Temp.—Room
      Tank —Steel lined with 18-8 columbium bearing stainless steel, exhaust casings
   6. Water rinse
   7. Zinc immersion treatment
      Zinc oxide[2]—13.4 oz./gal.
      Caustic soda—70.4 oz./gal.
      Time —2-5 minutes
      Temp.—Room (75-100° F.)
      Tank —Steel
   8. Water rinse
   9. Water rinse
   10. Electroplate

II. Cast alloys
   1. Vapor degrease and/or use inhibited alkaline cleaner
   2. Water rinse
   3. Nitric acid dip, conc. commercial



(Courtesy E. A. Vermere, Los Angeles, Calif.)

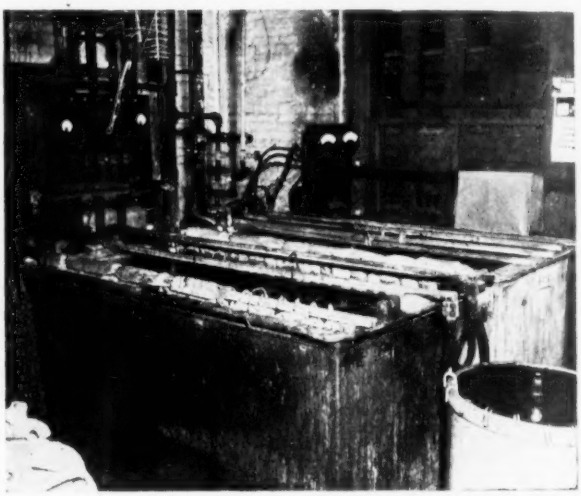
Figure 1. Plating aluminum products in a California high production plating plant.

Time —10-15 sec.
Temp.—Room
Tank —Steel lined with 18-8 columbium bearing stainless steel, exhaust casings

4. Water rinse
5. Caustic soda dip
   Caustic soda—6.7 oz./gal.
   Time —10 sec.
   Temp.—150° F.
   Tank —Steel, exhaust casings, seamless steel coils
6. Water rinse
7. Nitric acid-hydrofluoric acid dip
   Conc. commercial HNO_3—3 parts
   Commercial HF 48%—1 part
   Time —3-5 sec.
   Temp.—Room
   Tank —Steel with special carbon brick linings, exhaust casings
8. Water rinse
9. Nitric acid dip, conc. commercial
   Time —10-15 sec.
   Temp.—Room
   Tank —Steel lined with 18-8 columbium bearing stainless steel, exhaust casings
10. Water rinse
11. Zinc immersion treatment
    Zinc oxide—13.4 oz./gal.
    Caustic soda—70.4 oz./gal.
    Time —2-5 minutes
    Temp.—Room (75-100° F.)
    Tank —Steel
12. Water rinse
13. Water rinse
14. Electroplate

III. High Silicon casting alloys (Alcoa No. 13)

1. Clean
   Same as previous cycles
2. Water rinse
3. Chromic acid-sulphuric acid pickle
   Chromic acid—5 oz./gal.
   Sulphuric acid—24 oz./gal. (0.1 gal. 66° Be H_2SO_4 per gal.)
   Time —1-5 min.
   Temp.—150° F.
   Tank —Lead lined, exhaust casings
4. Water rinse
5. Nitric acid-hydrofluoric acid dip
   Conc. commercial HNO_3—3 parts
   Commercial HF 48%—1 part
   Time —3-5 sec.
   Temp.—Room
   Tank —Steel with special carbon brick lining, exhaust casings
6. Water rinse
7. Chromic acid-sulphuric acid pickle
   Chromic acid—5 oz./gal.
   Sulphuric acid—24 oz./gal. (0.1 gal. 66° Be H_2SO_4 per gal.)
   Time —1 min.
   Temp.—150° F.
   Tank —Lead lined, exhaust casings



(Courtesy Philip Sievering, Inc., New York City)

Figure 3. Nickel plating tank in foreground, aluminum treatment tank in rear.

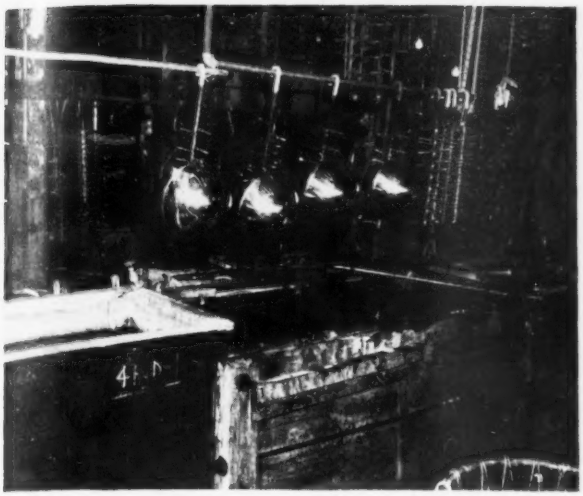
8. Water rinse
9. Zinc immersion treatment
   Zinc oxide—13.4 oz./gal.
   Caustic soda—70.4 oz./gal.
   Time —2-5 min.
   Temp.—Room
   Tank —Steel
10. Water rinse
11. Water rinse
12. Electroplate

(Courtesy Philip Sievering, Inc., New York City)

Figure 2. Aluminum parts immersed in caustic cleaning solution prior to zincate treatment.

Copper Plating

For subsequent nickel and chromium deposits, it is necessary to first copper plate aluminum prepared in the manner outlined above. The articles are given a strike in a Rochelle copper solution operated at 105° F. ± 5 with the pH adjusted to 9.6. They are then plated in either a Rochelle copper solution operated under standard conditions or in the amine copper solution. Electrical contact should be made immediately upon entrance of work into the copper



(Courtesy Phillip Sievering, Inc., New York City)

Figure 4. Plated articles of aluminum basis metal ready for rinsing.

bath. For the first few minutes, double the normal current density is applied to effect rapid coverage, after which the current density is reduced to normal.

Nickel Plating

The copper coating applied to aluminum should be at least 0.00005 inches, and preferably 0.0001 inch thick before transferring to the nickel plating bath. Bright nickel and cobalt nickel processes are excellent for this purpose.

Cadmium or Zinc

For wrought alloys: Follow the procedure given for the preparation of wrought alloys for plating given above, through step No. 6, then zinc plate in standard cyanide zinc solution operated at room temperature (75-100° F.). For zinc as the final finish continue from step No. 6 as follows:

7a. Strike for 5 minutes in cyanide zinc solution at 3-5 amperes per sq. ft.

8a. Continue plating to desired deposit thickness under normal operating conditions.

For cadmium as the final finish, proceed as follows:

7b. Strike for 5 minutes in standard cyanide zinc solution for 5 minutes at 3-5 amperes per sq. ft.

8b. Water rinse.

9b. Cadmium plate in standard solution under normal operating conditions.

For cast alloys: Follow procedure given above for cast alloys through step No. 8, then continue with modifications as outlined above for wrought alloys.

Brass

Brass deposits may be applied directly from a standard plating bath. For surfaces that are difficult to cover, a strike in the low pH, low temperature Rochelle solution may be desirable. The Aluminum Company of America suggests the use of brass as a strike prior to plating alloys with a substantial magnesium content such as 56S, 214 and 218, etc.

Silver

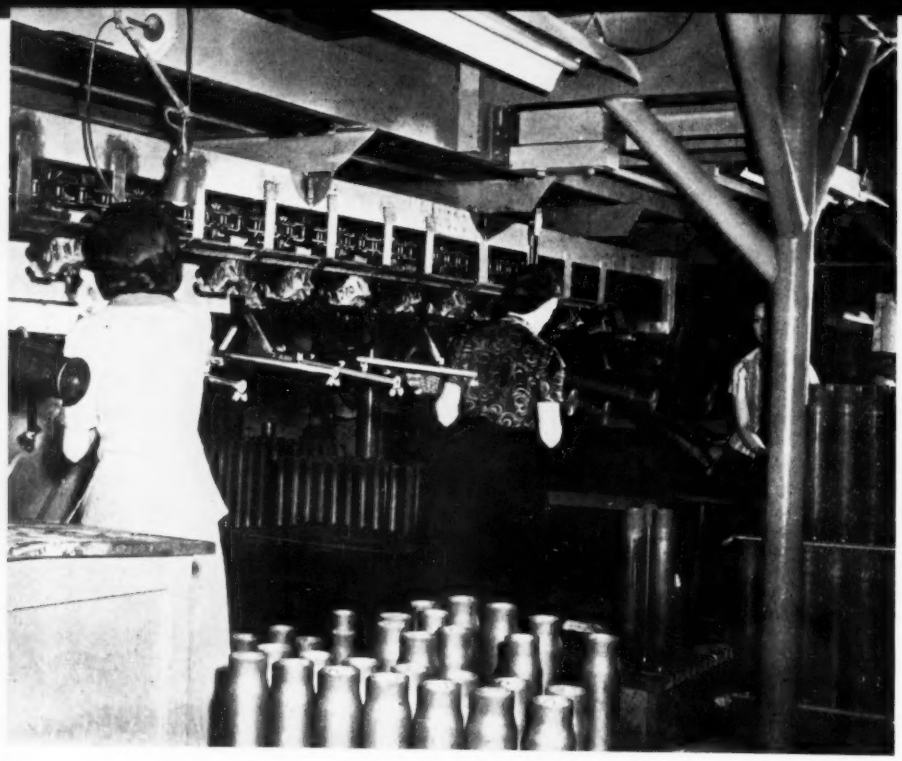
Silver can be deposited upon the zinc immersion surface by using a "first strike" followed by the usual "strike" and then silver plated in a standard silver cyanide solution. Formulas for these solutions are given on pages 296 and 297 in "Modern Electroplating" published by The Electrochemical Society, 1942.

Chromium

Chromium may be deposited directly upon the zinc immersion film by applying the initial deposit from a standard chromium solution operated at a temperature of 65-70° F., and then transferring the work to a solution operated at 130° F. The deposits are not bright but can be buffed to a high luster. For decorative plating, it is better to apply copper and nickel as an undercoating for chromium.

Notes

1. This step may be omitted except where the acid etch has become highly contaminated with copper, producing an immersion film of copper on the surface of the aluminum.
2. For plating on copper bearing alloys, wrought or cast, use 47.5 oz./gal. of zinc sulphate ($ZnSO_4 \cdot 7H_2O$) in place of zinc oxide.



Loading shells on conveyor in automatic plating setup.

Introductory Survey of Electroplating

By Rick Mansell, *Los Angeles, California*

ELECTROPLATING is a process in which thin layers of metallic coatings are deposited electrolytically on objects. The coating is applied to assist the corrosion resistance of the metal; or it may be applied for decorative purposes, to make the article more attractive to the eye. This process of electroplating will permit the use of relatively cheap metals from which the article may be fabricated and then later on coated with a more expensive metal. In certain cases, articles which are worn or damaged are electroplated with thick layers of metal which are built up on these pieces. Again, objects such as gages are first manufactured and then plated to obtain the final dimensions; the coating used being a harder and more resistant material than the main body of the article (chromium is commonly used for this purpose). The largest part of the commercial plating is applied to iron and steel; but there is extensive application to such metals as copper, brass, zinc, and aluminum.

Basic Principles

The metal to be deposited is dissolved from an anode of the material; this is immersed in an electrolyte; the electrolyte contains ions of the metal; these ions are discharged on the object being plated, which has been made the cathode. In other cases an insoluble anode is used, and the coating metal is obtained from ions provided by a salt of the metal added to the plating bath. Whenever soluble anodes are used as in the first case, then the electrochemical action at the cathode is the reverse of that occurring at the anode.

The voltage applied to the terminals of the bath is used to overcome the ohmic resistance of the anodes, the cathodes, the connectors, the external circuit, the various contact resistances, the resistance of the bath itself, the resistance encountered by films adjacent to the anode and cathode, the concentration polarization at these points, the polarizations for the metal deposition, and the difference between the anodic solution potential and the cathodic deposition potential of the metallic ion used. When insoluble anodes are used, oxygen may be evolved and the anodic solution potential is eliminated, in this case the overvoltage of oxygen as well as the decomposition voltage of the electrolyte become important factors. Generally speaking the terminal voltage of a plating tank is low; the generators are built to supply either 6 or 12 volts high amperage current.

In electroplating, a fine grained tenacious, strongly adherent, bright or readily polishable layer of deposited crystals is necessary; however there are two other classes of industrial deposition which have different requirements for the condition of the cathode

product. In electro-refining, large coarse grained but adherent deposits of high purity are required; these must be sufficiently strong to withstand the ordinary handling which precedes the usual melting and casting into shapes for further working. In the production of metal powders in the electrolytic cell controlled grain size of the product is needed, but here poor adherence to the cathode is the important factor. In refining and metal powder production the cost of the electrical power is important, but in the process of electroplating the quality of the plating is more important than the efficient utilization of electrical energy. Thus while in the plating of metals it is desirable to have high current and energy efficiencies yet these are often sacrificed without upsetting the economic phases of the operation.

In order to deposit one metal on another in a smooth firmly adherent layer it is necessary that the surface to be covered be perfectly clean and the electrodeposition effected under correctly determined operating conditions. The character of the deposited metal will depend on a number of factors, among these are the type of dissolved salt from which the metal is deposited; the strength of the solution; the temperature of the solution; the current density on the cathode; and finally the thickness of deposit that is built up. The total plating operation consists of: first, the cleaning and smoothing of the surface to be plated; second, the actual electrodeposition of the metal; third, the final polishing. After plating and drying, the objects may be polished with mild abrasives such as tripoli or rouge on a high speed wheel.

The two laws which govern the process of electroplating were established by Michael Faraday. The first is that the mass of a substance liberated or deposited by an electric current is proportional to the current and to the time it exists. The second is that when the same strength of current is sent through different electrolytes, the masses of the different substances deposited or set free in the same length of time are proportional to their respective chemical equivalents.

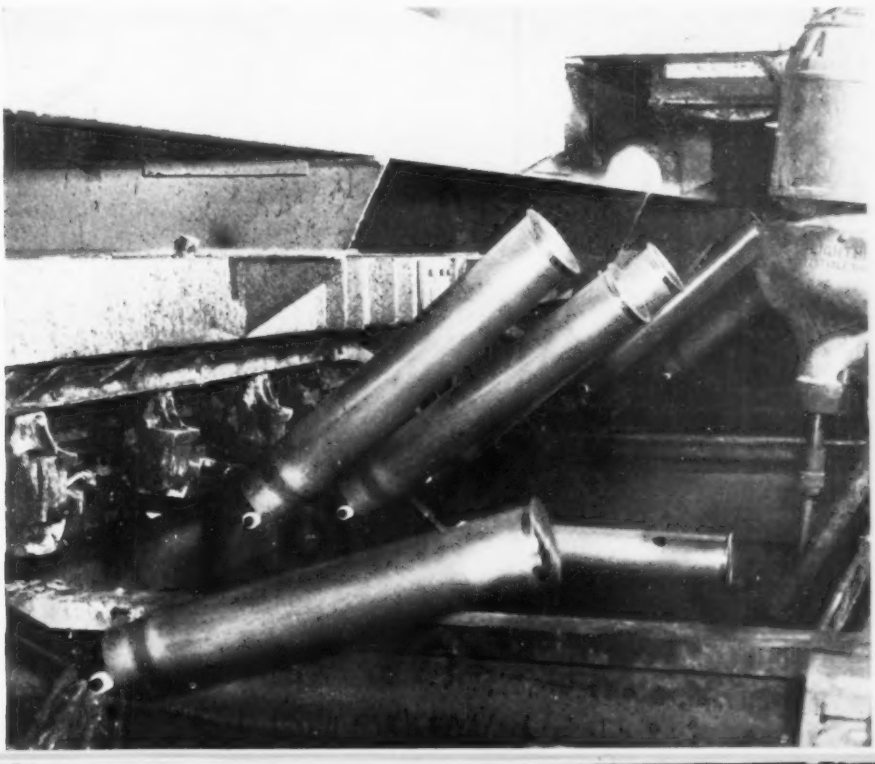
Function of Coatings

The noble metals such as platinum and gold are used as coatings which retain their color and luster under adverse conditions; they share this property to a lesser extent with less noble but passive metals such as nickel and chromium. While a coating of silver will resist oxidation, it is readily tarnished by sulphur compounds. Copper itself is tarnished both by oxygen and sulphur, however, it is used as a plating to protect certain parts of steel articles from absorbing carbon during the process of case hardening. Another example of the use of a metal plating to protect a base metal against a specified chemical reaction is the use of silver coatings to protect steel against oxidation during the heat treatment of steel in laboratory experiments. Again, nickel plated steel is used in alkaline storage batteries and oxygen-hydrogen cells; also nickel and chromium coatings are used in the manufacture of films and plastics because these metals resist many organic compounds.

Quite often it is desired to protect a base metal against wear caused by abrasion; in this case a coating is needed which is tougher and harder than the base metal itself. Chromium meets these requirements more nearly than any other single plating metal and so is extensively used for wear resistance on gages, dies, molds, and printing plates. Another use for plating which was pointed out previously is the building up of parts that are made undersize or the building up of worn parts. The three common metals used for this are iron, nickel, and chromium. Iron is the cheapest and can be subsequently case hardened. Nickel is most easily applied, while chromium is used when greater wear resistance is required. In this particular paragraph we have summarized some of the miscellaneous uses of plating. We shall now consider the major use, namely that of protecting base metals from corrosion.

Corrosion Protection

Zinc and cadmium furnish prolonged protection to steel in marine atmospheres but are rapidly attacked

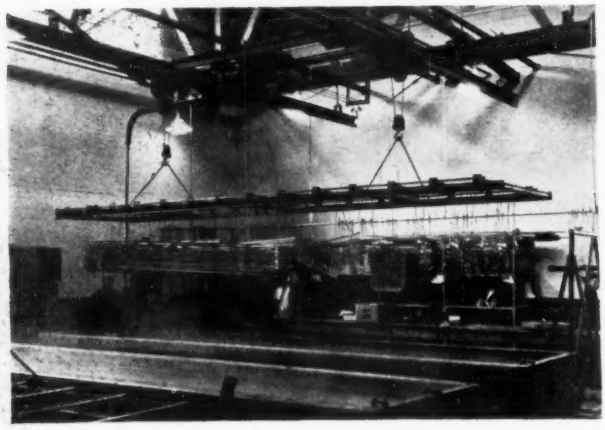


Closeup of shells on conveyor of automatic electroplating machine.

in industrial locations where sulphur compounds are present; under these sulphurous conditions it is found that zinc coated parts last longer than cadmium coatings of the same thickness. For either zinc or cadmium the protection is practically proportional to the thickness of the coating. It has been established that electroplated zinc coatings furnish about the same protection as zinc coatings that are produced by the hot dipping process or by Sherardizing. Zinc and cadmium coatings are less resistant to initial corrosion than iron and steel; we compare this with the coatings of copper, nickel, tin, lead, chromium, silver and gold, which are all more resistant to initial attack than iron and steel. Yet these latter coatings will furnish complete protection only if they are impervious, for if there are any pores or pinholes present, then the corrosion of steel at these points is usually accelerated. Compare this with zinc and cadmium coatings which sacrifice themselves to protect the base steel.

To protect steel against corrosion, nickel is commonly used, while a preliminary coating of copper is frequently applied (this copper may be more cheaply polished than the underlying steel or the superimposed nickel). Thin layers of chromium are used to increase the tarnish resistance. Tin and silver coatings are used largely because of their resistance to food and beverages. Lead is generally used for resistance to sulphuric acid. All the plated metals applied commercially to zinc and aluminum are more noble than these base metals and must therefore be thick enough to be nearly impervious to furnish good protection against corrosion; otherwise we run the danger of galvanic couples being formed with the base metal being sacrificed. Nickel coatings on zinc or aluminum, are usually of the same thickness as those used upon steel but on copper or brass thinner coatings are usually adequate.

As a general rule, a guide as to the ability of a metal to protect other metals against corrosion is obtained by a study of the electrochemical series of equilibrium potential; but we do have to bear in mind the existence of certain practical exceptions. Thus, although the potential of cadmium is less negative (more noble) than that of iron, it is found that a cadmium coating does protect iron that is exposed through small pin holes or pores. On the other hand, under equilibrium conditions, chromium is more negative (less noble) than iron; but because chromium becomes passive in the air, it accelerates the corrosion of iron exposed through the pin holes.



Work being loaded into cleaner tank of 4,000 gallon capacity, the loaded rack carrying 2,000 square feet of surface.

Electroplating Factors

The important factors in the success of electroplating such as the appearance, the adhesion, the porosity, and the protective value will depend on the base metal itself, the surface preparation, and the conditions of electrodeposition. As far as the nature of the base metal is concerned we have considerations of the surface conditions, the degree and nature of the polishing processes and the presence of pores, cracks and inclusions. As far as surface preparation is concerned it is very necessary to have a chemically clean surface to secure good adhesion of the deposits. In the various cleaning processes we remove grease and foreign particles. Steel surfaces are usually pickled. Non-ferrous surfaces are usually immersed in special compounds to remove oxides and other compounds which may include absorbed alkali; in some cases they are immersed in compounds used to etch the surface. Among other processes used are sandblasting and rolling.

An important factor in the conditions of electrodeposition is the composition of the baths: the major constituents are kept constant to about plus or minus 5% of the amounts present. The permissible content of each impurity is determined by the past experience. The acidity or the pH is controlled in all except the very acid or alkaline solutions. The temperature of the bath is controlled within specified limits (these limits are narrower for chromium than for other plating baths). The average current density is kept within the desired limits for the sake of uniformity of thickness and the general quality of the coatings.

In many baths the agitation permits an increase in current density; in some cases a stronger system of agitation than that supplied by oscillating rods or continuous conveyor operations is supplied by air or by rotating electrodes. The anodes must be of such a composition and structure as to maintain the metal concentration; this means that the anode efficiency should be nearly the same as the cathode efficiency. In the case of chromium plating, and a few others when insoluble anodes are used, the metal content is maintained by regular replenishment.

Coating Properties

The porosity of coatings is determined by the salt spray test. Poor adherence of the coating is detected by deforming of specimens; by bending, twisting, hammering, extruding, or by stretching. The hardness of each plated metal varies over a wide range depending on the conditions of deposition; it is found that electrodeposited nickel and iron may vary in Brinell hardness number from 150 to 400, while that of chromium will vary from about 500 to 900. The luster and the reflective power of the deposits is

important, the brightness being expressed on a plane surface as the ratio of the specular reflection (in which the angle of reflection is equal to the angle of incidence, say 45 degrees) to the diffuse reflection (the reflection at all other angles). For protection against special industrial conditions, definite types of accelerated cycles are devised.

The average thickness of coatings is measured by stripping or dissolving the coating from a measured area and determining its amount by the loss in weight or by chemical analysis of the resultant solution. The minimum thickness at any point is measured by a microscopic examination of a suitable cross section, or by other methods which depend on the rate of chemical reaction; for example the Preece test for zinc coatings; the spot test with concentrated hydrochloric acid for chromium coatings; the dropping test for zinc and cadmium coatings; and the jet test for nickel coatings. The actual distribution of the coating depends on the throwing power of the solution (this will be referred to later on in this article) and upon the shape of the article and its position with respect to the anodes and the racks.

Bath Characteristics

In the plating bath we have present the salt or acid containing the metallic ion or radical. If this salt is not sufficiently conductive, it is necessary that an additional compound be added whose specific function will be to increase this conductivity. Usually the metallic ion, salt, or acid prevents the passivity of the anode, but if its action is not sufficiently effective, a compound is added to increase the anode corrosion. Again, addition agents are employed in small amounts to alter the crystalline nature of the product deposited. Also, if it is required that the bath be operated only within a narrow range of acidity, then a buffer is added to maintain the proper pH of the solution. Compounds may be added to the plating bath which fulfill one or more of these functions. To illustrate these points we refer to the common nickel plating solution: this will have the metallic ion in the form of nickel sulphate, $NiSO_4 \cdot 7H_2O$; to increase the conductivity ammonium chloride, NH_4Cl, or ammonium sulphate, $(NH_4)_2SO_4$, is added; to assist the anode corrosion, nickel chloride, $NiCl_2 \cdot 6H_2O$, is added; and finally boric acid, H_3BO_3, is added to act as a buffer and maintain the pH of the solution. When we consider the tin plating bath, we find the tin salt furnished by sodium stannate, Na_2SnO_3; then caustic soda NaOH is present to assist the conductivity and also the anode corrosion; and then we have addition agents present such as glucose or other organic materials to improve the deposit.

Plating baths are classified in a number of ways; for example there are the sulphate baths, cyanide, chloride, perchlorate and phosphate baths depending on the type of metal salts from which the metals are deposited. In most cases a metal anode is the source of the plating metal. These anodes may be commercially pure or they may be specifically modified so as to produce certain desirable characteristics in the

Large parts being removed from a cleaner tank. Note soapy foam on work; this must be rinsed off prior to plating.

cathode deposit. In a number of cases the electrolytic constituents are the source and reservoir of the ions of the cathode deposit and the anodes used are of the insoluble type. In a number of other cases a combination of an active anode and an insoluble anode is found expedient; an example of this is the cadmium cyanide baths where both cadmium which dissolves and forms the Cd ions, and steel which is insoluble, are employed as anodes. This arrangement is made so as to balance the solution of the anode and the deposition at the cathode, which in the absence of the steel occurs at different rates.

In order to lower the resistance of the electrolyte we add salts, acids, or bases to it. When we add sulphuric acid to a copper sulphate solution, an increase in the conductivity of the solution results; the effect of this is far greater than the decrease in the concentration of the copper ions brought about by what is known as the "common ion" effect (the sulphate SO_4 radical being the common ion). An increase in current density causes an increase in the output of the bath but in most electroplating operations the operating range is controlled by the character of the deposit, which is the all important factor.

The term throwing power refers to that particular property of a solution which enables it to throw a relatively uniform distribution of metal on a cathode of an irregular shape. The distribution of metal on a cathode is determined by the secondary current distribution and by the cathode current efficiency. It is possible to calculate the throwing power mathematically by a computation of the cathode single potentials, the conductivity of the solution and the current efficiencies. It has been found that most conducting salts and compounds which tend to increase the cathode polarization also tends to improve the throwing power. When the distribution is uniform the bath is said to have good throwing power.

An increase in temperature usually increases the conductivity of the electrolyte; it also produces an increase in diffusion rates in the chemical solution at the anode, and a re-solution at the cathode; but the overall effect is a decrease in polarization and a lowering of the cell voltage. The lowering of the resistance of the electrolyte causes a lessened current

concentration at protruding points on the cathode so that the irregularities will develop less rapidly. Again the increase in temperature will promote hydrogen evolution and will promote the precipitation of contaminating salts; both these factors affect in a detrimental fashion the character of the deposit.

The metal ion concentration is affected by the molal concentration of the salts. The physical chemist usually finds it convenient to express concentration in moles per liter; the designation mole meaning molecular weight in grams. A solution containing 36.40 grams of hydrochloric acid per liter is called therefore a molar solution. This designation is also applied to ions in solution; thus a solution is said to be molar in hydrogen ions if it contains 1.008 grams of H per liter. A molal solution is one containing one mole in 1000 grams of solvent. This distinction between a molar and a molal solution is emphasized by some and disregarded by other chemists. It is introduced here to remind the reader of some of the terms used in electrochemical considerations. The metal ion concentration depends on the ionization of the salts and the temperature; it is affected by the presence or absence of common ions or of other bath constituents with which complex ions may be formed. With very low molal concentrations we may obtain powdery deposits even at low current densities. Among the complex ions, those of the double cyanides are favored for the plating of metals such as silver, copper, cadmium, zinc, and brass.

The character and appearance of the deposit as well as the current efficiency is markedly affected by the pH of the electrolyte from which the metal is deposited. It is common to express the acidity of a solution in terms of the so-called hydrogen exponent pH: this is the value of log 1/c where c is the concentration of hydrogen ions in moles per liter. Thus a concentration of 10 to the minus 5 moles of hydrogen ions per liter is expressed briefly by saying the pH is 5. It is very easy to tell when the hydrogen ion concentration corresponds approximately to a pH of 5, because methyl red indicator in dilute solution changes from red to yellow at this point. In the electroplating of nickel a buffer such as boric acid is added to maintain the pH at a desired point of 5.3. As an example of the influence of pH values we note particularly that in the plating of nickel the operating conditions are different if the process is carried on near the neutral point as compared when it is carried on at low pH values under the conditions of relatively greater acidity. In the case of iron deposition the acidity of the bath may be of such a high order that there will be an actual chemical dissolution of the deposit at a rate exceeding that of electrolytic deposition.

An important factor to consider is the anodic metal solution; this anodic solution of a metal in an electrolyte of its own ions takes place almost reversibly with the development of some concentration polarization in the films adjacent to the anode. The formation of these anode films and the production of passivity are factors which increase this polarization which is necessary for the continuance of the solution of the anode. Thus we find that anode corroding agents are added. Chlorides are very effective in this respect and they are used in nickel plating and nickel refining operations to overcome the tendency of the metal towards passivity.

From the preceding notes it can readily be inferred that the characteristics of the deposited metal will depend a great deal on the character of the electrolyte, the pH of the solution, the metal ion concentration, and the anodic and cathodic current density. The quality of the deposit can be improved by adding to the electrolyte a wide range of colloidal substances; organic products of high molecular weight have been found to give smoother and finer grained deposits. Again it is found that metal ion additions affect the character of deposits; these are referred to as brighteners—examples are the addition of nickel, cobalt or copper salts to cadmium electrolytes.

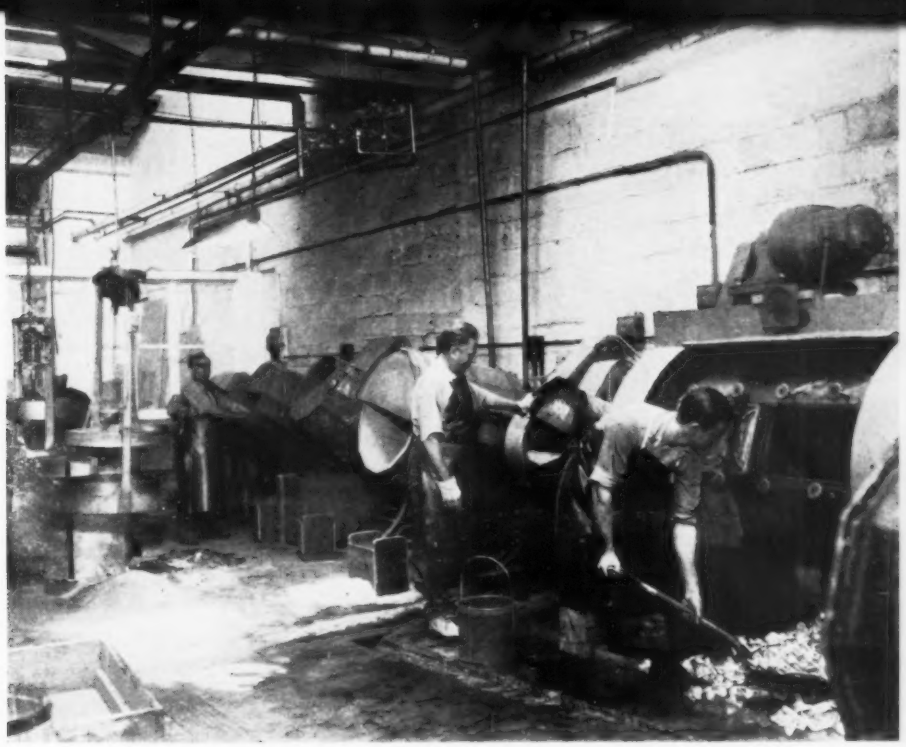
Solution Components

The electrolyte itself with particular reference to the ions present affect the character of the cathodically deposited metal over a wide range (electrodeposited metals all show a crystalline structure upon X-ray examination). Silver when deposited from silver nitrate forms readily visible crystals which are very large. Tin deposited from a solution of stannous chloride will form long needles which may rapidly bridge from anode to cathode. The deposits of lead from a chloride or acetate solution are markedly different from those produced when a chlorate or a perchlorate is the anion. Nickel from a sulphate bath may give hard deposits which may ultimately be polished but from a napthalene sulphonate bath we get bright deposits which need little polishing.

Plating baths are always operated within definite current density ranges beyond which, on both sides of the range, poorer types of deposits are obtained. Plating baths having low ionic metal concentration are used for the production of fine grained or the so called amphorous deposits; these are readily polishable. Such low ionic concentrations are produced not by using dilute solutions but either by the use of those salts which show a low ionization or by salts whose ionization has been depressed by the addition of another salt having a common ion. Alternatively we can produce the required low ionic concentration by the employment of compounds which produce the metallic ion not by a primary ionization but by a secondary ionization. Examples of compounds producing low ionic concentration are the double salts, such as nickel ammonium sulphate and the complex compounds such as the double cyanides.

The water used to make up the plating solutions should be clean and pure; usually the water supply of modern cities is sufficiently pure for the purpose, but it is suggested that this always be checked to take care of some abnormal situation. The chemicals used should be of a fairly high grade of purity.

(To be concluded next month)



Section of tumbling room; tumbling, deburring, burnishing.

Pre-Treatment for Barrel Plating

By Mario Mazzone and Floyd McKnight

IN THE opening years of the century, plating barrels became an accepted part of the electroplater's equipment. They quickly proved advantageous for the plating of a variety of small pieces—buckles, clips, hooks and eyes, small cycle fittings, safety pins, tie clasps, suspender parts and other items. The revolving barrel technique saved the labor of wiring and racking up the pieces one by one, as it is done in still tank electroplating. And the new method quickly proved adaptable, too, to practically all types of plating solutions.

As is usually true of new developments, perfection was not immediate. The first models were cumbersome. Because they were almost entirely of wood, they were heavy. Frequently they offered great resistance to current. Effecting the necessary deposit of nickel required from four to seven hours, depending upon the thickness of coating desired and upon other special conditions.

By October, 1915, the literature contained reference to an apparatus which would make electroplating wholly automatic. The apparatus consisted of an "automatic plating barrel" for treating material such as nails, screws, rivets, washers, stampings and the like in bulk. When used in conjunction with the automatic cleaning and drying apparatus provided, this equipment would clean, plate, wash, dry and discharge the materials being plated without handling from the time the pieces were placed in the barrel until the pieces were delivered. The entire equipment consisted of a plating barrel suspended on top of a tank, as well as a separate revolving drum for cleaning, with sections for draining and drying. Barrel construction was of celluloid, non-absorbing and of high tensile strength. No moving parts, except the barrel itself, were immersed in the solution, because the barrel was suspended on top of the tank. Until that time the entire driving mechanism had gone into the solution. The new method provided a quicker and more even coating of a greater surface and one operator could tend three or four barrels simultaneously because of the 30 to 60-minute time cycle of coating. When a load of plated pieces passed on to the cleaning drum, the plating barrel could be quickly reloaded; then, by the handling of a single control, the first batch could be started on their way through the cleaning drum and a second batch in the plating barrel.

Since 1915 several producers have interested themselves in manufacturing barrel plating equipment. Operation of a barrel is usually less expensive than regular tank plating because of the volume involved; yet for purposes of coating small pieces and certain types of shapes, the technique is vastly superior to any other. Of course, when a plant has installed the equipment, it now and then will use the barrels

even for larger pieces, depending on their shape. Many companies installed barrel plating equipment which proved outstandingly valuable for the output of ball bearings during World War II. By no other means can bearings be so uniformly coated.

A present large user of the barrel plating method is a prominent manufacturer* of toy and model railroad trains and accessories. Between 80 and 90 per cent of all the electroplating done in this plant is performed in revolving barrels and an account of what occurs in the plating department to add lustre, brilliance and realism to its toy cars and locomotives will perhaps serve to present a good over-all picture of the development of the art and science of barrel plating in more recent times.

The judgment of the man in charge of the metal finishing department and the plating foreman becomes highly important for the selection of the proper procedure in each separate case, for the preparation of the surface of the article to be plated as well as for plating itself. This judgment must be based on sound economic and scientific principles. A variety of metals and alloys must be processed to provide a far greater variety of individual small parts for the finished trains and locomotives, tracks and other accessories.

The foreman must learn to give the parts a minute physical inspection as soon as they are brought to the plating room prior to electroplating. On the basis of this inspection he must decide which parts are appropriate for barrel-plating and which operations are essential to produce the results desired in each instance.

He bases his decisions in this regard on three prime considerations:

1) The type of material to be plated

2) The condition of material prior to electroplating

3) The type of plating and finish sought.

Most of the work plated consists of parts made of different types of steels, brass and die castings of aluminum, zinc and bronze. These materials, after being properly conditioned, receive one or more electrodeposits. The coatings are of nickel, zinc, chromium, silver, acid copper, cyanide, cadmium, tin, black oxidizing and black nickel. In some instances, one part will receive as many as two or three coatings to produce a desired effect.

As a general rule, for alkaline baths such as zinc cyanide, copper cyanide and cadmium cyanide, the tanks are made of steel. But in the case of nickel or silver the steel is rubber-lined to protect the tank from being attacked by the solution or from contaminating the solution through causing the presence of excess iron in the bath.

Selection of the type of plating to be performed and the thickness of the deposit proceeds in each instance from a consideration of the ultimate use of the part in question and the conditions to which it is to be subjected—whether it is intended mainly for indoor or outdoor service, the type of atmosphere that is to surround it, whether it is primarily ornamental and whether it must withstand strong corrosion tendencies.

The preparation and conditioning of metal parts which are to be electroplated comprise a process as important and complicated as plating itself. These preliminary stages may be roughly divided into several sub-stages—deburring, tumbling, burnishing, degreasing, pickling and bright dipping.

The cleaning operation before plating is either mechanical or chemical or both, depending on the condition of the train parts. Removal of drilling burrs, sawing burrs, stamping burrs, machine tool burrs, molding fins and fire scale takes place in the tumbling room. This room is equipped with different types of horizontal, polygonal and vertical barrels, oblique variable tilt barrels, sieves of different mesh, motor-driven mechanical sieve vibrators and sawdust boxes for drying.

The tumbling room, which is a component of the plating room, is divided into two sections, one of these utilizing the dry tumbling method and the other the wet tumbling method.

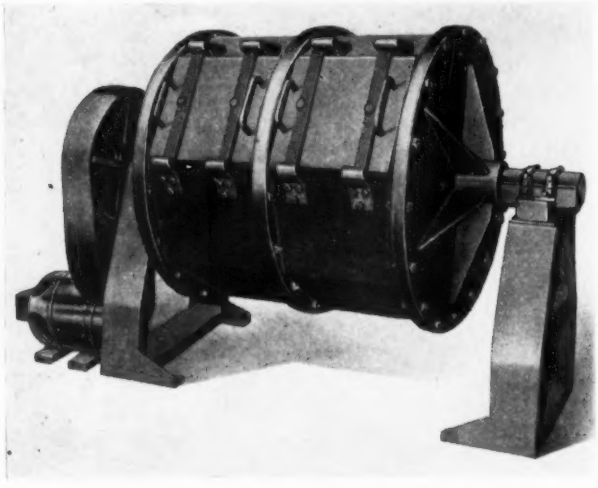
The dry method is used for removal of slight burrs, oxides and oil and for the drying of wet plated work, as well as sometimes for brightening the surface prior to electroplating. For this method, as a rule, an open-mouthed steel or maple wood polygonal, oblique variable tilt barrel best serves the purpose. Frequently, maple wood barrel tumbling is used in conjunction with dry sawdust or refined, granulated corncob for removing oil from the parts or for drying them after plating.

The purpose of the steel barrel is to remove slight burrs or oxides or to produce a smooth, bright surface. These barrels, which are individually motor driven, may be tilted to any desired angle, depending on the load and shape of the articles. Barrel rotation is generally at the rate of 15 to 20 revolutions per minute.

The wet tumbling method is applicable to parts having large burrs, molding fins and heavy scale. In this process it is important to select the proper type of barrel abrasives and mineral or metallic slugs.

The continuous rolling pressure and rubbing action in the case of a heavy load affect the finish of the

* Lionel Corporation, Irvington, N. J.



Two compartment deburring and tumbling barrel.

resulting part, whereas small and delicately constructed parts receive a more satisfactory deburring in a low pressure barrel. It is readily understandable, therefore, that the kind of material and the shape and size of the piece being finished must govern to an important degree the type of barrel used, as well as the types of abrasives and slugs.

Actually the wet tumbling process uses both oblique variable tilt barrels and horizontal barrels, the horizontal style being lined with maple wood. The maple acts as a cushion for the load being tumbled and lessens the impact of the parts rolling around together in the barrel. The barrels are in each instance geared to variable speeds, and the experience and judgment of the plating foreman again comes into play in an important way in deciding the proper speed of rotation to be used. Ordinarily, the speed in the wet tumbling process varies from 15 to 30 revolutions per minute.

For removing burrs from parts made of ferrous alloys, the firm applies the following formula:

Ferrous parts to be deburred	1 gal.
Mineral slugs	2-3 gals.
(Size of slugs depend on whether the parts have large or small crevices or recessed sections)	
Deburring compound	1 pound
Water	½ gal.

Rolling time is a function of the size and location of the burrs. If the burrs are large, naturally they require more friction in the deburring process. If they are situated in out-of-the-way positions on somewhat intricately shaped parts, where they receive less friction, a longer rolling time may be required.

For removal of burrs from parts made of non-ferrous metals in brass, castings, copper and aluminum, the following formula is employed:

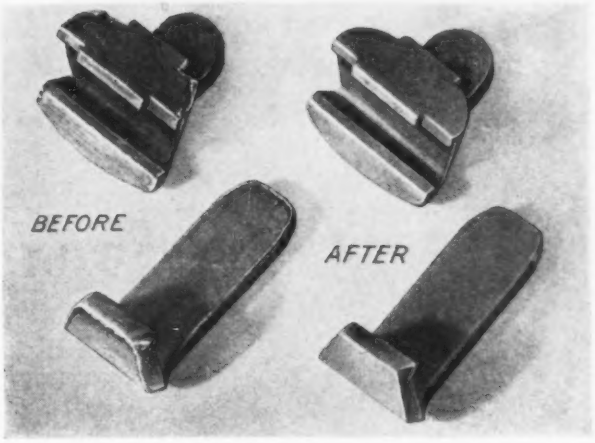
Non-ferrous parts to be deburred	1 gal.
Metallic or mineral slugs	3 gals.
Deburring compound	1 pound

The rolling time follows the same principles for ferrous and non-ferrous parts. In the case of non-ferrous work such as brass and copper it is important to select an abrasive compound that will not attack or tarnish the parts. Particular care must be exercised in the purchase of abrasives in order to accomplish this. Another formula for non-ferrous work is as follows:

Parts	1 gal.
Metallic or mineral slugs	3 gals.
Deburring compound	1 pound
Water	½ pint

Slugs are generally of steel or stone depending on the type of burr and the job to be done. The foreman has constantly to be on guard to choose exactly the type of slugs for each batch of work, as well as to decide whether he is going to use dry or wet tumbling, sawdust or granulated corncobs. In the case of wet deburring, he has to choose the amount of water very carefully, considering this amount as a function of the sharpness and quality of the abrasive.

After deburring, the parts are rinsed to remove any abrasive compound that has been entrapped or that may adhere to the surface. They are then immersed in boiling alkali cleaner for a period lasting from one to three minutes, after which they are rinsed in cold water and dipped into a 50% hydrochloric acid solution for removal of any surface oxide or rust not removed during the tumbling and deburring. There are two rinses in cold running water.



Parts before and after burnishing and finishing.

If steel parts are to be held for a time instead of being processed immediately, a cyanide or alkali dip becomes necessary to prevent oxidation.

Burnishing is necessary on all wet deburred parts to revive the lustre as well as on occasion to decrease the porosity of the metal or make it corrosion-resistant. Depending upon the purpose of the burnishing in each individual case, it sometimes precedes and sometimes follows the plating operation.

In any event, the burnishing process employs horizontal barrels such as those used for deburring. Metallic slugs are also necessary, but soap replaces the abrasive compound used in deburring, the intention of the whole process of burnishing being to close any pores that may form on the surface of the parts and to produce a fine lustre.

For all these preparatory steps great emphasis must naturally fall upon keeping the barrels clean and upon the cleanliness and purity of the compounds, if a smooth and clean finish is to result. These precautions are particularly necessary in chemical cleaning.

When the foreman of the finishing department decides upon the chemical cleaning of steel parts he adopts one procedure; and when he utilizes it for the cleaning of brass and copper parts, his procedure must be slightly different.

In the case of steel parts, a vapor degreaser is utilized for the removal of oil, or a hot alkali cleaner having a concentration of from 6 to 8 ounces per gallon. The operator immerses the work for one minute or more depending on the amount of surface impurity.

For rust and oxide removal, in the case of steel parts, the alkali dip is followed by a rinse in cold water and a dip in a 50% hydrochloric acid solution until all rust and oxide disappear. Next come two rinses in cold running water and a final sodium cyanide dip.

In pickling, and particularly in choosing the for-

(*Concluded on page* 82)

Tricks of the Polishing Trade

By H. Moore, *Kirkstall, Leeds 5, England*

This paper gives practical hints on polishing and buffing holders for parts which are otherwise difficult to handle. Although many of these ideas are familiar to finishing executives, the paper is well worth reading for the quality of suggestions and ideas given.—Ed.

THERE must be few polishers who have not from time to time discovered or invented a short cut or handy way of overcoming operational difficulties. Like all other occupations demanding a high proportion of manual dexterity, polishing lends itself admirably to the art of inventing those simple devices which can be made on the spot. Wood, nails, rubber, leather, cardboard, tin and other things are found almost everywhere. The usual shop scrap pile contains specimens of each. It is with such stuff that the polisher fashions the auxiliary tools of his trade, and it is what the present writer has used to make the helpful things described below. They are all original and hitherto unpublished. The thoughts and notions expressed in the article are his too, and are the result of hard practical experience.

First, something about heat as it affects polishing. The inconveniences of friction heat is not particularly apparent until the smaller type of work is being done. For these articles gloves cannot be worn, yet it is just this kind of work that heats up almost as soon as it touches the buff. If such work must be held in the fingers it is better not to attempt to finish it but partly to do so and lay it aside while another piece is similarly treated; in other words, to do the work in stages short enough to avoid painful heating. It may sound slower but in the end this is quicker than the too commonly attempted practice of buffing until the piece is so hot, and has to be handled so gingerly, that it flies out of the hands.

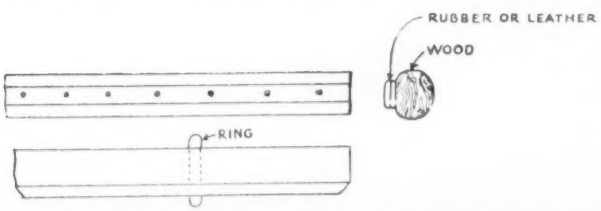


Figure 1. A strip of wood and rubber or leather for holding rings.

For all such work a holder should, if possible, be made. For anything resembling rings with a large enough hole, a holder out of a strip of wood and a strip of rubber is made. These two are placed lengthwise and joined together with a few short tacks. The wood provides the solid backing and the leather provides the "give" which is necessary to grip the rings tightly when they are pushed against the wheel. The completed holder resembles a lead pencil with a flat side on which a strip of rubber is tacked.

Another form of ring holder is a length of stiff wire bent to a long U shape. The wire should fit the hole approximately and be so bent that when one side is in the hole of the workpiece, the other side is bearing against the outside of it. When the ends of the wire are pressed together the ring is tightened between them. To revolve the ring release the grip slightly and buff will move it around. Imagine gripping a small button by pressing the ends of a hairpin together and you have a rough picture of this holder.

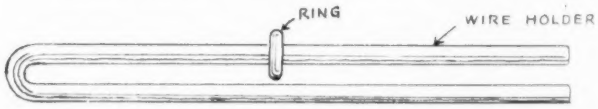


Figure 2. By bending a stiff wire in a long U shape, another ring-holder may be made.

Holders for minute articles should not only hold the work but also release it without touching to avoid burns. Tiny bead-like pieces may be threaded on a string, one end of which is tied to one end of a flat piece of wood about 6 by 2 by 1 inches. The other end of the wood is made with a short saw cut. The loose end of the string is put in this and pulled tight enough to resist the force of the buff on such light jobs. When finished, the string is removed from the slot and the pieces allowed to slide off. Holeless workpieces can sometimes be held in pliers with leather protected jaws, in holders of wood with suitably placed nails or in the slit of a piece of old belting. A tourniquet holder is made from two sticks about six inches long; a loop of strong twine is wrapped around one end of each stick, and the sticks

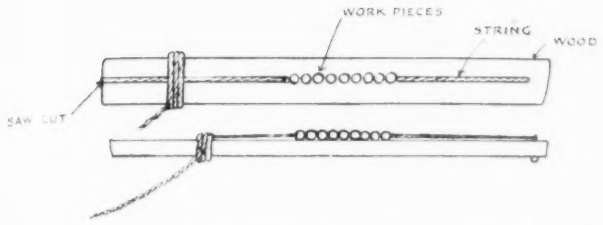


Figure 3. For bead-like pieces, a long narrow piece of wood holds the parts firmly after threading them on a string.

twisted around until the twine is twisted loosly between them. If a piece—say a short stud with the head to be polished—is placed beneath the twine on one of the sticks and the sticks turned until the piece is gripped tightly and both sticks brought into line, a satisfactory holder for this type of job is obtained. Any similar kind of work which allows the polished end to protrude from the end of the sticks is suitable for this type of holder.

One of the inconveniences of buffing is the difficulty of seeing just what the buff is doing. From this cause we often see unbuffed spaces on finished work; much depends on the way the work is presented to the buff. For example, suppose a brass tube three feet long and six inches diameter is to be buffed. Some operators would hold this horizontally and roll it around, others would hold it vertically and keep turning it. In both cases it is hard to see where each fresh pressure begins and ends and the whole tube must be carefully examined to see that no places are untouched. A compromise between these two methods

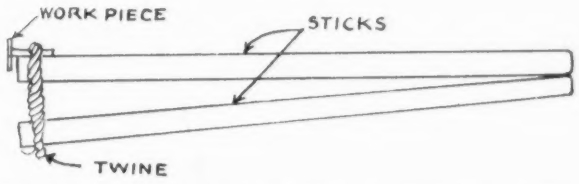


Figure 4. A tourniquet-type of holder for polishing and buffing the heads of studs, bolts, etc. Note how work is held by twine.

seems to do the work better. Such work is held at about a forty-five degree angle and it is run up and down and around. The work can be seen more clearly by this method.

Take another common job—square brass plates. If these are buffed parallel with the edges to nearly half way there will be only a square left in the middle to be removed with the plate held corner ways. The way the plate is held is all important. It is possible to buff these plates without actually looking to see how the work is proceeding and without any danger of catching the buff on the top side. The opposite kind of surface, wavy or with hills and valleys, should have all the high spots buffed first. In doing this it will be found that most of the low spots have received inadvertant attention and that little more is required to finish them. These and other kinds like them save a lot of stopping and staring.

Another frequent cause of trouble is work on which some part needs protecting from the buff. No one can guarantee not to slip and it is necessary to protect the surface in one way or another. Plates, or anything with one or two projections to polish on the face, may have the projections protected by a piece of cardboard with a hole, or holes, to slip over them. If there are a lot of such pieces it pays to cut out a piece of tin and punch holes in it to suit. The projecting parts can then be pressed into the buff without the latter showing any effects on the face. Emery paper wrapped around a vital part will prevent buff marks; there is usually plenty of this material in a polishing room.

Anything with a saw cut in it looks bad if it is buffed without preparation. To preserve the sharp edge of the cut, a piece of soft wire is wrapped around the job, with the wire just big enough to lay on top of the slot. For hole protection, wood dowel stock

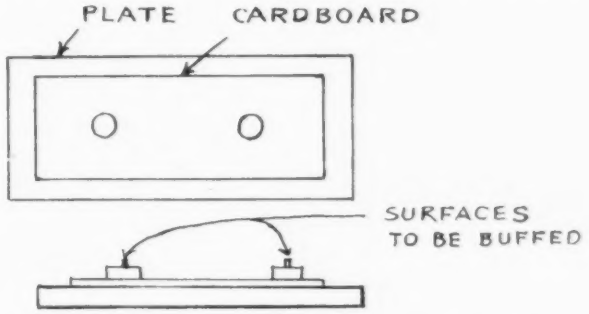


Figure 5. For polishing and buffing projections on a flat or contoured piece, a cardboard guard or mask may be used.

that fits the hole snugly may be used, sawing it off a little above the surface and tapping it level with a mallet. The same plug will do for many pieces with the same size hole.

While it has taken some time to collate the material in even this short article it is, of necessity, only a sketchy attempt to cover the subject. But nevertheless, it is reasonable to assume that much of this will be new to many readers. The value of a contribution of this kind lies not only in its direct information but also in its quality of suggestion: a described device may be of little use other than for the work it was made and yet for other kinds its application, with minor alterations may be easily possible. And since the possibilities of the polishing

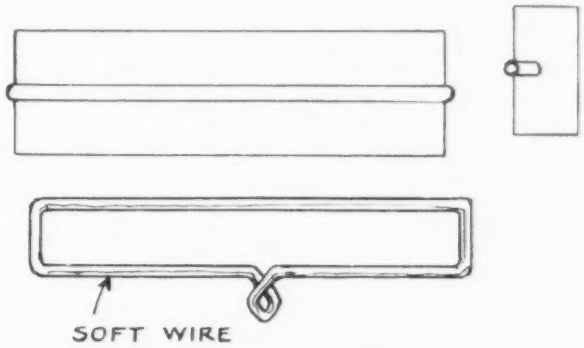


Figure 6. Parts that are grooved may be buffed by inserting a soft wire in the groove to protect sharp edges.

trade are so wide there is ample scope for all the ideas and suggestions of every practical man in the trade who has originated any. If only a minor fraction of these reached the printed stage it would be of great benefit.

Determination of Silver and Copper in One Sample of Plating Solution

By Louis Silverman, *Materials Engineering, Chemical Laboratories, Westinghouse Electric Corporation, East Pittsburgh, Pa.*

THE speed and accuracy of Mott's[3,4] iodide titration for copper in cyanide and acid plating solutions can be improved by employing the most recent techniques. The very careful adjustment of acidity by ammonium hydroxide and acetic acid may be dispensed with, and uncertain end-points will not occur.

If a solution of potassium iodide is added to an acid solution of copper sulfate, iodine is liberated, and the amount liberated is the measure of the cupric copper in the solution. The equation is:

$$2\ KI + CuSO_4 \rightleftharpoons K_2SO_4 + CuI_2 \quad (1)$$

$$2\ CuI_2 \rightleftharpoons 2\ CuI + I_2 \quad (2)$$

The explanation of equation (2) lies in the fact that the "stable valence" of copper under these conditions is one, not two. (This is indicated by the position of copper in Group I of the Periodic Table of Elements). Cupric oxide, CuO, valence two, heated to 800°C changes to cuprous oxide, Cu_2O, valence one.

Since the reactions are reversible, it frequently happens that the solution of copper which has been titrated with thiosulfate turns blue again. A simple way to prevent this is found in the use of sodium thiocyanate.[2]

$$CuI + NaCNS \rightleftharpoons NaI + CuCNS \quad (3)$$

The effect of NaCNS is to remove CuI from solution. With no CuI available, no CuI_2 will be found, and as a result, there will be no iodine formed later when the titration with thiosulfate has apparently been completed.

One other detail must be observed. Usually the procedure directs: "Add ammonium hydroxide until the solution is blue, acidify with acetic acid and add 2 to 3 ml in excess". The acidity of this solution varies with the amounts of ammonium hydroxide, acetic acid and the volume of water used. Also, the careful regulation of the acidity and alkalinity is somewhat difficult. If the acidity is not properly adjusted, the end-point will not be sharp and the titration will be incomplete.

In 1912, Mott[4] introduced the so-called Short Iodide Method for Copper, in which procedure fluoride is added to convert ferric sulfate to un-ionized ferric fluorides:

$$Fe_2(SO_4)_3 + 6\ NaF \rightarrow 2\ FeF_3 + 3\ Na_2SO_4 \quad (4)$$

If fluoride ion were not added, then ferric sulfate would react with potassium iodide to give free iodine, and the results for copper would be high:

$$Fe_2(SO_4)_3 + 6\ KI \rightleftharpoons 2\ FeI_2 + I_2 + 3\ K_2SO_4 \quad (5)$$

The reason for this reaction is somewhat similar to that of equation (2).

Later, Crowell [1] found that ammonium bifluoride would serve the double purpose of introducing fluoride ion and acting as a pH buffer. If a sufficient amount of ammonium bifluoride is added the acidity of the solution will be correct, and the acidity of the solution will not be affected by ordinary amounts of ammonium salts or changes in volume. Such solutions will give sharp end-points, (the solution will be colorless or but slightly yellow), and the blue color will not return within twenty minutes.

Procedure for Titration of Copper in Cyanide Copper Solutions

Pipette a 10 ml sample into a 300 ml flask. Add 15 ml of nitric acid and 10 ml of sulfuric acid (or perchloric acid). Evaporate to heavy fumes of sulfur trioxide (or perchloric acid). Cool, add 50 ml of water and boil until solution is complete. Cool thoroughly.

Add ammonium hydroxide until the solution just turns blue and again cool in running water. Add 8 grams of ammonium bifluoride and shake to dissolve the fluoride. The solution should now be acidic (pH 3 to 4). Add 10 ml of 50% potassium iodide solution and mix. Titrate the liberated iodine with 0.1 N sodium thiosulfate until most of the brown color has disappeared, then add 6 ml of a 50% sodium thiocyanate solution and about 2 ml of a 1% arrowroot starch solution. Continue titrating with the standard 0.1 N sodium thiosulfate solution until the blue color disappears.

Calculation:

ml $Na_2S_2O_3$ × Normality × 1.19 = CuCN oz./gal.

For copper sulfate determination in Acid Copper Plating Solutions, use a 5 ml sample, and proceed as above.

TABLE I

Determination of Copper in Plating Solutions

	Type of Bath	Electro-deposition Method	Titration Method	Calculation
1.	Cyanide	0.103	0.104	grams, Cu
2.	Cyanide	0.200	0.202	grams, Cu
3.	Cyanide	0.247	0.247	grams, Cu
4.	Cyanide	0.356	0.358	grams, Cu
5.	Acid	0.478	0.487	grams, Cu
6.	Cyanide	2.12	1.99, 2.00	oz./gal., CuCN
7.	Cyanide	2.41	2.33, 2.33	oz./gal., CuCN
8.	Cyanide	2.73	2.76, 2.78	oz./gal., CuCN
9.	Cyanide	3.45	3.48, 3.63	oz./gal., CuCN
10.	Acid	25.2	25.0, 25.2	oz./gal., $CuSO_4 \cdot 5H_2O$
11.	Cyanide		2.3 vs 2.4(a)	oz./gal., CuCN
12.	Cyanide		2.7 vs 2.9(a)	oz./gal., CuCN
13.	Cyanide		4.0 vs 4.3(a)	oz./gal., CuCN
14.	Cyanide		2.6 vs 2.7(a)	oz./gal., CuCN
15.	Cyanide		3.0 vs 3.0(a)	oz./gal., CuCN
16.	Cyanide		3.2 vs 3.2(a)	oz./gal., CuCN
17.	Cyanide		3.4 vs 3.4(a)	oz./gal., CuCN
18.	Acid		24.3 vs 24.3(a)	oz./gal., $CuSO_4 \cdot 5H_2O$

(a) Check determinations by two analysts

TABLE II

Determination of Silver and Copper on the Same Sample

	Single Cu Determination CuCN, oz./gal.	Sequence Determination	
		CuCN, oz./gal.	Ag, oz./gal.
1.	0.22(a)	0.18, 0.22(a)	1.3, 1.3
2.	0.7	0.7	1.9
3.	1.5	1.4, 1.5	0.06, 0.08
4.	1.9	1.9, 2.0	2.2, 2.2
5.	2.2	2.2, 2.3	0.48, 0.48
6.	4.2	4.2	0.03
7.	5.7	5.7, 5.9	0.06, 0.08
8.	—	1.3, 1.3	10.1, 10.2

(a) Check determinations by two analysts

Calculation:

ml $Na_2S_2O_3$ × Normality × 6.67 = $CuSO_4.5H_2O$ oz./gal.

The accuracy and reproducibility of the procedure was checked by several analysts. In Table I, solutions from four cyanide and one acid bath were used. The results are calculated in grams. Another set of titrations were made and calculated to the conventional CuCn and $CuSO_4.5H_2O$. Finally results for duplicate tests by other analysts are listed (11 to 18).

The foregoing titration technique may also be applied to mixed cyanide silver-copper solutions. The silver may first be titrated as usual by standard sodium thiocyanate solution. The same solution is then made ammoniacal and the copper is titrated as in the above procedure for copper. An important difference is that enough extra potassium iodide must be added to convert silver thiocyanate to silver iodide. However, the procedure is not satisfactory if silver cyanide is greater than 10 oz./gal. and coppper cyanide is less than 0.2 oz./gal., unless the analyst has considerable experience with this technique.

In Table II results by two analysts are listed. One determined copper by titration as in the above procedure, while the other determined silver as silver thiocyanate and then determined copper on the same solution.

Procedure for the Sequence Titration of Silver and Copper in Cyanide Solutions

Pipette a 10 ml sample into a 300 ml flask. Add 10 ml of nitric acid and 10 ml of sulfuric acid (or perchloric acid). Evaporate to heavy fumes of sulfur trioxide (or perchloric acid). Cool. Add 50 ml of water and 2 ml of 2% ferric ammonium sulfate, and cool to room temperature. Titrate with 0.168 N sodium thiocyanate solution to a faint brown color. If the bath is high in copper, the end-point is a colorless, or nearly colorless solution.

Calculation:

ml NaCNS × 0.30 = AgCN oz./gal.

Add ammonium hydroxide until the solution just turns blue or until red ferric hydroxide forms, and cool in running water. Add 8 grams of ammonium bifluoride and shake to dissolve the fluoride. The

solution should now be acidic (pH 3 to 4). Add 15 grams of solid potassium iodide and mix. Titrate the liberated iodine with 0.1 N sodium thiosulfate until most of the brown color has disappeared, then add 6 ml of a 50% sodium thiocyanate solution and about 2 ml of a 1% arrowroot starch solution. Continue titrating with the standard 0.1 N sodium thiosulfate solution until the blue color disappears.

Calculation:

ml $Na_2S_2O_3$ × Normality × 1.19 = CuCN oz./gal.

Solutions

0.1 *N Sodium Thiosulfate.* Weigh 50.0 grams of $Na_2S_2O_3.5H_2O$, dissolve in water, transfer to a 2000 ml flask and dilute to the mark with water. Add 2 grams of sodium benzoate as preservative. The solution should be permitted to "age" for four weeks in a dark bottle. The solution will maintain its factor for about 4 weeks.

Standardization. Accurately weigh 1.000 grams of pure copper and transfer to a 400 ml beaker. Dissolve the metal in 10 ml of water and 10 ml of nitric acid, add 10 ml of perchloric acid and evaporate to fumes of perchloric acid. Cool the solution, add 50 ml of water and boil for five minutes. Transfer the solution to a 1000 ml volumetric flask and dilute to the mark with water. Pipette a 100 ml aliquot into a 300 ml beaker and follow "Procedure for the Titration of Copper".

Calculation:

$$\text{Normality of Thiosulfate Solution} = \frac{1.573}{\text{ml } Na_2S_2O_3 \text{ Titration}}$$

0.168—*N NaCNS.* 13.61 grams per liter of water. Standardize against 50 ml of 0.1 N $AgNO_3$ (16.99 grams per liter), as described in the "Procedure for the Sequence Titration of Silver and Copper".

Calculation:

$$\text{Normality of NaCNS Solution} = \frac{2.976}{\text{ml NaCNS Titration}}$$

50% *NaCNS Solution.* 500 grams dissolved in 1,000 ml of water.

50%*KI Solution.* 500 grams dissolved in 1,000 ml of water. Add one gram of NaOH.

Starch Solution. Transfer 10 grams of arrowroot starch to a 100 ml beaker. Add sufficient water to make a paste, and slowly pour the paste into 1000 ml of boiling water. Continue boiling for 15 minutes. To the cold solution add 2 to 3 grams of zinc chloride as preservative.

Ammonium bifluoride is obtainable in the technical grade.

Acknowledgment

The author expresses his thanks to Edward Paulson, Virginia Stewart and Ethel Verney who provided data for this paper.

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PRE-TREATMENT FOR BARREL PLATING

(Concluded from page 77)

mula for the pickling solution, the finishing department must use great care to prevent excess etching or any pitting at all. Over-pickling is sometimes costly. It produces pitting, brittleness and carbon smuts. As a result, the deposit may have poor adhesion qualities necessitating rejection of the work. The department always tests adhesion by bending or twisting the metal part in each case, and if the adhesion is not satisfactory, the electrodeposit will peel off.

In the chemical cleaning of brass, copper and zinc die cast parts, the company utilizes the same methods of oil removal as in the case of ferrous metals. Particular care is essential, however, in selecting an alkali cleaner applicable to brass and copper work; otherwise stains will result.

For removal of oxides and other surface impurities from brass and copper parts, a sulphuric and nitric acid mixture, having the following composition, becomes necessary:

2 parts sulphuric acid
1 part nitric acid
1 quart of water per gallon
4 to 6 cc. of hydrochloric acid

The Baumé Hydrometer reading is from 45 to 47 degrees.

The amount of hydrochloric acid in a specific solution is very important. A too great amount will produce surface spots—an effect whose exact cause is not yet completely known. When such an effect appears, the whole solution must be thrown away or steps taken to reduce the chloride concentration. Addition of finely divided carbon or soot to the bright dip serves to remove excess chlorides.

Three water rinses complete the cleaning of the brass and copper parts. The importance of the rinse cannot be over-emphasized, because every last trace of acidity or alkalinity clinging to the materials must be removed to prevent a carry-over into the plating solutions. Removal of scale and oxides serves to brighten up the surface of copper and brass to a remarkable degree. Non-ferrous train parts receive no cyanide dip; cyanide or alkali will tarnish copper and brass pieces when they are allowed to stand.

Abrasive Methods—Surface Treatments—Control
Electroplating—Cleaning—Pickling—Testing

Shop Problems

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Blistering on White Metal

Question: I have trouble with my solutions. They continue to blister even after I have made a number of changes in the solution. I am using white metal, zinc and aluminum composition, United American No. 7 and No. 8. I tried using No. 7 metal and it blistered, then I tried No. 8 which has a copper content and it still blisters. Please advise me as to the cause and how to remedy this condition. The same condition of blistering exists even on ordinary brass plating with a copper foundation.

W. K.

Answer: There are several possibilities for correcting your troubles. You must be positive that the cleaner you use is not too strong or that you have not left the work in the cleaner too long. Many times vapor degreasing polished zinc alloy work to remove compound then a 30-second treatment in a mild anodic cleaner is ample to clean the surface. Many people try to plate directly from this cycle; a dip in approximately 5% sulfuric acid is necessary to remove the alkaline film left on the work from the cleaner bath. Immerse long enough for bubbling to start on the work, thus insuring complete neutralization of the film. Rinse thoroughly in clear running water, then plate. Blistering is invariably caused by improper cleaning, rather than alloy composition, although surface inclusions and impurities may cause this condition also; however, in this case it sounds as though your cleaning cycle is too strong.

Cleaning Old Silver

Question: Could you please advise a satisfactory process to clean old silver pieces?

E. C. W.

Answer: By removing grease and oil compounds in your cleaner, then dipping in a solution of 4 to 6 oz. per gallon of sodium cyanide, most silver is brightened. If this is not satisfactory on your work, buffing and coloring on the wheel should clean the material, after the cyanide dip and rinse.

Spot-Out of Brass Plate

Question: I brass plate steel picture frames. They look nice after polishing, but the next day are all spotty. What can I do to correct this?

R. R.

Answer: In all probability the basis metal has trapped cyanide underneath the brass coat. It is customary to plate iron or steel with the cycle copper-nickel-brass, which effectively prevents spit-outs and gives a durable finish. If you are positive the surface does not have impurities under the coating, would recommend that you flash your work with copper.

Plating Brazed Parts

Question: Do you know of any metal or alloy which can be used in joining copper parts, preferably by means of a gas torch which, when finally machined and polished after joining, would match in color the copper basis metal.

S. S. K.

Answer: Copper welding rod can be used to join together copper parts. However, this is a very ticklish operation due primarily to the ease with which the oxides are formed at the melt point as well as the high heat conductivity, hence the tendency to burn, of copper. It is suggested that the parts be brazed with silver by means of a gas torch, machined and polished to the desired finish, and then plated electrolytically in the regular cyanide-copper solution. Care must be taken to get the parts chemically clean prior to plating. If this is unsatisfactory, it is recommended that the parts be so designed as to permit a lap at the joining section, thereupon either spot or seam welding by resistance methods.

Testing for Tin, Zinc and Cadmium

Question: Please send me information relative to a reliable method of distinguishing between tin, zinc and cadmium anodes in a small shop where testing apparatus is very limited.

W. C. S.

Answer: By dissolving the metal in 1.24 sp. gr. nitric acid it will fume copiously if it is tin and a bulky white precipitate of metastannic acid will be formed; the other two metals will not do this. Tin coatings and anodes may be further identified by adding solid cacotheline to the solution formed when the metal is dissolved in hydrochloric acid (10%). A reddish-violet color indicates the presence of tin. The differentiation between cadmium and zinc may be accomplished by making the nitric acid solution, in which the metals were dissolved as above, alkaline to litmus by additions of concentrated ammonia, and then adding a 10% sodium sulfide solution. A white precipitate indicates zinc, whereas a yellow precipitate indicates the presence of cadmium.

Hard Chromium on Aluminum

Question: Can you tell us whether aluminum or magnesium are being

plate with appreciable thicknesses of hard chromium commercially? It would be our thought that, if underlying coatings of softer metal are required, such as the zinc immersion or copper processes, the value of the final coating as an abrasion-resistant would be of dubious value.

R. J. M.

Answer: It is agreed that with the zincate coating underneath one would assume that the softer metal would affect the value of the abrasive-resistant coat; however, in this case it is used primarily as a conductor for subsequent coatings and the thickness should theoretically not affect the properties of the final coating because of its extreme thinness. This is exemplified in metallurgy by induction heating the teeth on spline shaft for wear and abrasion resistant while leaving a soft core to take up shock. Would recommend you try a few samples for checking.

Black Oxide on Aluminum

Question: I wish to obtain a black oxide on an aluminum tray which has a flower design in the center. Then i want to remove the black oxide and leave it only in the flower design. How can I do this?

A. J. C.

Answer: Most black oxide coatings are patented processes using proprietary salts and various anodizing and oxidation methods. By dipping aluminum in hot caustic soda, a black smut is formed if the metal is alloyed with certain percentages of copper. The work must be rinsed thoroughly or the caustic will continue etching the surface.

Silver Strike Formula

Question: Please advise of a silver strike formula and procedure to pre-plate old, used nickel silver, copper and brass objects in a way to avoid immersion plate.

A. M.

Answer: For nickel silver, brass and copper we do not recommend immersion strike, but suggest strike using current as follows:

Silver cyanide	0.6	oz./gal.
Sodium cyanide	9	oz./gal.
Free cyanide	9	oz./gal.
Metallic silver	.45	oz./gal.

Room temperature; 6 volts 15-25 amps./sq. ft.

Cleaning Threads in Taps

Question: We flash-chrome plate taps and have difficulty getting base of threads properly cleaned. We have tried several stripping solutions but cannot get the streaks out of threads. We also have small internal dies with holes 3/16" diameter x 1¼" long. What is the best material for an anode? We put on approximately .015 per side.

G. J.

Answer: For getting base of threads properly cleaned, suggest you acid pickle in 15% hydrochloric acid for a minute, rinse, then scratch brush with tooth brush and wet pumice. A good anode for the small internal dies is antimony lead—the usual material for chrome plating baths.

Spot-Out of Silver Plate

Question: I refinish silver and brass and can't prevent silver from spotting. The spots are very white and plain to see with the naked eye. Brown spots appear (usually after lacquering) on brass plating.

R. A. G.

Answer: We suggest a bright nickel between the brass and silver. This would take about three minutes and should inhibit the absorption of silver by the brass. Another suggestion is to strike your work in a low metal content silver bath, although the nickel undercoat is most effective.

Silver Strip

Question: I'm in the musical instrument repairing business and I have to strip the silver plate from instruments before I can lacquer them. Is it possible to strip silver plate from an object without using the reverse process of plating?

C. M. M.

Answer: We recommend that you use the following formula.

Sulfuric Acid	19 parts
Nitric Acid	1 part

180°F.

Keep water out of this bath.

Rectifiers for Electroplating

Principle of Operation

The principle of rectification is founded in the free passage of alternating current between two dissimilar metals in one direction, and the high resistance to its passage in the opposite direction.

Basic Construction

The complete modern rectifier consists of a transformer to step down the a.c., the rectifying unit or "stack" to convert the current to d.c., and the various control devices. The rectifying unit consists of metal plates or discs which have been coated with another metal or metallic compound; the contact for one polarity is made with the metal plate or disc, while the contact for the other is made with the metal coating. Rectification takes place at the contact surface of the plate and its coating.

Available Types

Copper Oxide—Available in both plate and disc type. Latter limited to low amperage operation and has small value in plating room. Plate type, consisting of copper plate with a cuprous oxide coating, affords efficiencies better than 70% and is available in standard or custom built apparatus.

Selenium—Use of selenium coated steel plates covered by a layer of special alloy is becoming an extremely popular type of rectifier. Available in a wide range of capacities, the units are light in weight, very compact and offer efficiency ratings approximating 70%.

Magnesium-Copper Sulphide—Although efficiencies are somewhat lower than obtainable with copper oxide and selenium rectifiers, the high allowable current densities permit an unusually small and compact unit.

Rectifier Characteristics

1. Simplicity of installation.
2. Compactness . . . minimum of floor space demanded.
3. Low maintenance cost due to minimum of moving parts.
4. Instant starting.
5. High efficiency . . . especially in small sizes.
6. Noiseless operation.
7. Power flexibility . . . individual units hooked up in series or parallel can be utilized for a variety of voltage and amperage requirements, or each rectifier may be used as an independent current-providing source.

Patents

Electrolytic Deposition of Rustproof Coatings

U. S. Patent 2,428,318. *John S. Nachtman, September* 30, 1947

A method of making steel strip and the like comprising electroplating on

steel strip base stock at least three layers of two metals selected from the group consisting of tin, lead, zinc, iron, nickel, chromium, copper, bismuth, antimony, cadmium, silver and alloys thereof, one of said metals being between two layers of the other metal, then heat treating the base stock in a non-oxidizing atmosphere at a temperature below the annealing temperature of the base stock and below the melting point of the lower melting point metal, the time and temperature of heat treatment being sufficient to form two thin partial alloy layers of adjacent plated metals of substantial thickness but no greater than .0005" between said adjacent plated metals.

Nickel Electroplating Composition

U. S. Patent 2,427,280. *Raymond A. Hoffman, assignor to E. I. du Pont de Nemours & Company, August* 15, 1947.

A nickel plating composition for dissolving in water to make an aqueous plating bath comprising nickel chloride, nickel sulfate, and 2-phenyl ethylene sulfonic acid.

Electrodeposition of Molybdenum-Cobalt Alloys

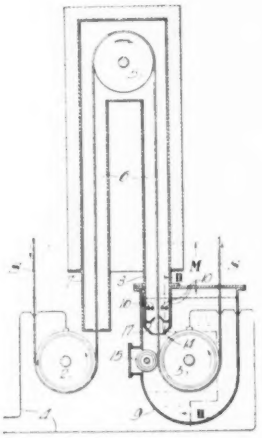
U. S. Patent 2,428,404. *Leonard F. Yntema, assignor to President and Board of Trustees of St. Louis University, October* 7, 1947.

The process for electrodepositing an alloy of molybdenum and a metal of the class consisting of cobalt and iron which consists in passing a current between an anode and the work to be plated as a cathode in an aqueous electrolyte consisting essentially of 10 to 30 grams per liter of a hexavalent molybdate compound, 5 to 15 grams per liter of a soluble compound of a metal of the class consisting of cobalt and iron, 100 to 300 grams per liter of free alkali metal hydroxide and 10 to 30 grams per liter of an organic compound having a hydroxyl group of the class consisting of sugars, glycerine, glycols and tartaric acid.

Means for Recovering Coating Material from Melted Electrolytically Coated Continuous Strip Material

U. S. Patent 2,428,362. *Klaus Egge, assignor to Carnegie-Illinois Steel Corp., October* 7, 1947.

In combination with apparatus for coating electrolytically continuous length strip material, means for melting the coating thereon so as to obtain a smooth, high-luster finish, a tank



having a quenching medium disposed therein into and through which the strip passes immediately after it is delivered from the melting means, a horizontally disposed rotatable roll arranged in said tank and around which said strip passes, said strip being delivered from said melting unit to said roll at an angle to the horizontal, means for introducing the quenching fluid under pressure into the quenching tank in substantially a horizontal plane substantially into the path of the strip on the inner side thereof at a point above said roll, and an inclined trough member arranged in said quenching tank above said roll adjacent the inner side of the strip and below the path of the fluid directed thereinto, said fluid circulating the quenching medium in the vicinity of the strip so that any excess coating material or scale is forced from the space between the strip and said roll and caused to drop either into said trough member or into the bottom of said tank.

Irregularly Shaped Article Finishing Machine

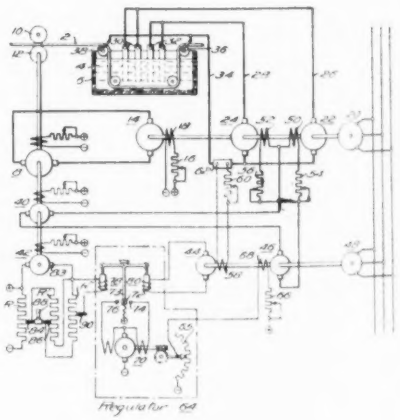
U. S. Pat. 2,426,764. *Sigmund A. Czarnecki, assignor to United Aircraft Corporation, September* 2, 1947.

In a machine for finishing irregularly shaped articles, in combination, a travelling belt having an abrasive surface, a work support, a contact roll for positioning the abrasive surface of said belt relative to a piece of work on said support, said roll having a peripheral depression therein constituting a developed impression of a surface of a finished work piece, means for effecting relative reciprocatory movements between said roll and said work piece, and means for oscillating said roll about its axis in timed relation with said reciprocatory movements.

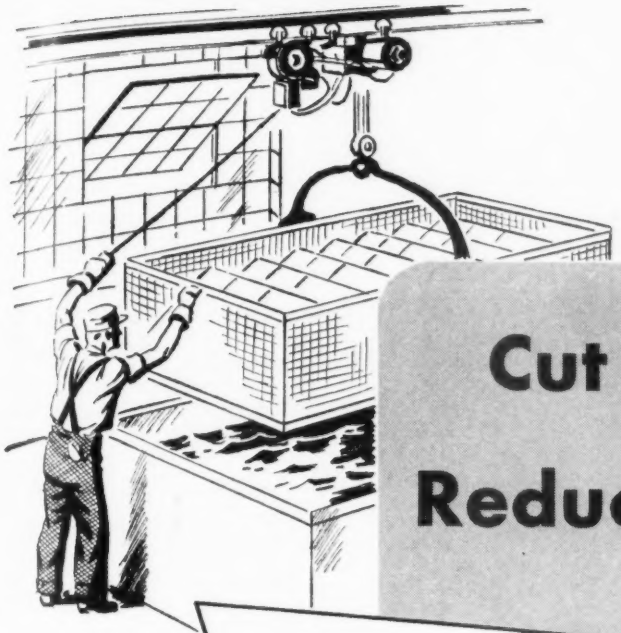
Control of Electrolytic Processes

U. S. Patent 2,427,661. *Willard G. Cook, assignor to Westinghouse Electric Corporation, September* 23, 1947.

In a control system for an electrolytic process, first and second means responsive to the speed of travel of a length of material through the process, means responsive to said first speed responsive means for varying the density of current flow in the electrolytic process in accordance with the speed of travel of the material, regulating



means, means responsive to the second speed responsive means and the current density in the process for causing the regulating means to vary the current density in the process, and selectively operable means for varying the



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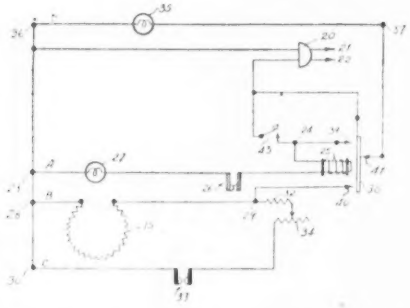
effect of the second speed responsive means on the regulating means so as to produce the desired range of variation of the current density with a predetermined range of variation of speed of the length of material from a predetermined maximum current value corresponding to a predetermined maximum speed value.

Automatic Temperature Control System

U. S. Patent 2,427,444. *Paul V. Colombo, assignor to Electronic Utilities Company, September* 16, 1947.

In a control system for automatically deactivating a heating means at a predetermined time after the material heated had attained a predeter-



mined temperature, an electrical circuit comprising a first circuit portion including a conductor characterized in that upon the passage of an electric current therethrough, the heating means is energized to transfer heat to said material and a first switching means for connecting said conductor to a source of electrical energy, a second circuit portion shunting said conductor, comprising an auxiliary electric heating means and a normally open first thermostatically operated switch in series electrical connection with said auxiliary heating means; said first thermostatically operated switch being operated to close by the heat generated by the main heating means upon the material attaining a predetermined temperature, a third circuit portion including an electromagnetic coil, a normally closed second thermostatically operated switch in series electric connection with said coil; said second thermostatically operated switch being operated to open by the heat generated by the auxiliary heating means and a second switch means for connecting said third circuit portion to the source of electrical energy, and an armature having a normal initial rest position, adapted to be shifted to a moved position upon actuation of said electric magnetic coil and means to restore said armature to its initial rest position upon deactivating said coil; said armature being adapted upon assuming its moved position as it would be shifted upon actuation of said coil, to close the first and second switching means whereby current is made to flow through the first and third circuit portions, and upon return to its initial rest position, to open said first and second switching means whereby current through the aforesaid conductor is made to cease and the main heating means is thereby deactivated.

Process for Cleaning, Stripping, and Polishing Metal Surfaces

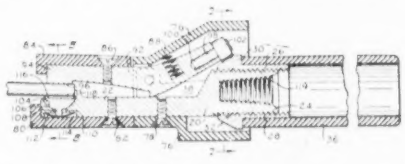
U. S. Patent 2,428,141. *Thomas Burkhardt, assignor to General Motors Corporation, September* 30, 1947.

The process of electrolytically cleaning, stripping copper from, and polishing the surfaces of ferrous articles which comprises immersing said surfaces in an electrolyte consisting essentially of an aqueous solution of between two and ten ounces per gallon of tetrasodium pyrophosphate maintained at a temperature above 180° F. and passing a direct electric current at a potential between seven and twelve volts from said surfaces as anodes to a suitable cathode in contact with said electrolyte.

Electrode Holder

U. S. Patent 2,427,002. *Percy Jepson, August* 15, 1947.

An electrode holder comprising a body of electrically conductive material, means on said body engageable only by one extremity of an electrode and including a member movable with the electrode to dispose the electrode at a predetermined angle relative to the body, positive stop means asso-

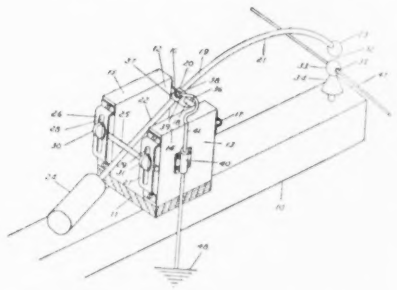


ciated with said member to contact the end face of the electrode and prevent end-wise movement thereof in one direction relative to said member, and manually adjustable means mounted on the body to engage the electrode and rigidly secure said movable member and the electrode against movement relative to each other and to said body, in response to forces incidental to application of the electrode to the work.

Electric Current Arrester

U. S. Patent 2,427,460. *George E. Johnson, September* 16, 1947.

In combination with a cross-bar and a line wire supported thereby, said support including a contact member in circuit with the line wire, a current arrestor comprising a frame supported by the cross-bar having a vertical standard, means on the frame for supporting the standard and in-



sulating it from the cross-bar, a horizontal shaft mounted upon said standard, a conducting member mounted upon said shaft to swing in a vertical plane and having a conducting point on one side of it and an extension on the opposite side, the conducting point being positioned to come opposite the contact member with a gap between them, a horizontal bar vertically adjustable and extending above and contacting the extended part of said swinging member for adjusting the width of the gap to prevent arcing of normal line wire current but to permit discharge arcing of excess current, and a ground connection to said conducting member.

Process for Providing Rust Free Surfaces on Ferrous Metal Parts

U. S. Patent 2,428,364. *Max Frager, October* 7, 1947.

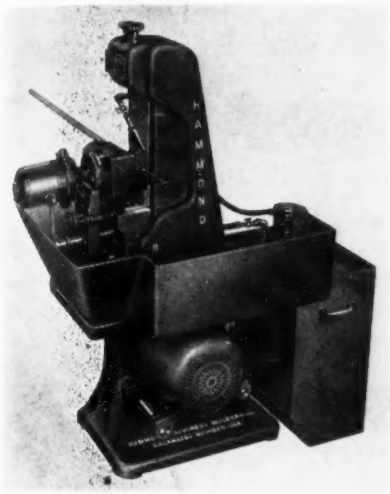
A process for providing rust free surfaces on ferrous metal parts which comprises subjecting said parts to an aqueous rust removing solution of ammonium citrate, washing said solution from said parts, submerging said parts in a dilute aqueous solution of sodium nitrite, transferring said parts to a soluble oil emulsion containing an emulsifying agent whereby the water on said parts is displaced by said oil, removing the excess of emulsion adhering to said parts, and then evaporating the water from said parts.

New Methods, Materials and Equipment for the Metal Finishing Industries

Recent Developments

Centerless Wet-or-Dry Grinder-Polisher

The Hammond Machinery Builders, Inc., Dept. GP-39, Kalamazoo, Mich., has announced a new addition to its line of grinding and polishing equip-



ment. It is known as the OD-1 Cylindrical Grinder-Polisher for rods, bars and tubes from ⅛" to 1¼" diameter.

It is a centerless machine using coated abrasive belts for grinding and polishing. For stock removal it will remove up to .005" per pass on ferrous metals and up to .010" on non-ferrous. Work supports will handle ½" bars up to 18' long and 1" bars up to 8' long. Accuracy .001" on production items—closer limits on some work.

The endless abrasive belt is 4" wide, 60" long, and may be operated dry or wet with coolant. Wet operation is recommended as it gives better finish, does not discolor work from heat, and gives higher production and longer belt life.

Two methods of feeding are employed—through-feed and in-feed. The through-feed method is generally used and is accomplished by swinging the regulating wheel on its horizontal axis from zero to 12°. The rate of feed can be varied from zero to 18' per minute.

Although Hammond has just announced the OD-1, the machine is not new to them in that the first machine was exhibited at the National Metal Congress in Cleveland in 1944 and sold at the show. This machine has now given more than two years of satisfactory service.

The OD-1 is now in production and on about a four weeks' delivery basis. For further information write to Hammond Machinery Builders, Inc., Dept. GP-39, 1601 Douglas Ave., Kalamazoo, Mich.

Elastic Synthetic Coating

The development of a new synthetic coating, which can be built up to extra-heavy thicknesses, has been announced by United Chromium, Inc. Primarily designed to insulate and protect electroplating racks, it displays wide possibilities for numerous other products.

This material, marketed as Unichrome Coating 218, contains 100% solids, with nothing to evaporate. It is a baking synthetic, applied by dipping or spraying, and upon curing at 350°F. becomes a sleek, elastic coating. On some racks, thicknesses up to ¼ inch can be achieved within two hours, on areas where such a degree of protection is desirable. This coating has been found to withstand mechanical abuses without chipping, tearing or lifting from equipment to which applied.

Tests reveal it also withstands a broad variety of strong chemicals in addition to hot cleaning solutions and all plating baths. Its characteristics make it especially suitable for use on dipping baskets, wire screens, mixing equipment, propellers, rotors of air-blowers, and as gaskets and linings.

For more details, write to United Chromium, Inc., Dept. MF, 51 East 42nd St., New York 17, N. Y.

Controlling Chrome Plating Mist

R. O. Hull & Company, Inc. have announced a new product called No-Cro-Mist which is added in small amounts (½ to 1 gallon per 500 gallons of solution) to chromium plating baths to control the evolution of fine fog or mist by chemical means rather than by mechanical covering of the surface of the bath.

No-Cro-Mist is a soluble liquid that changes the physical form of the usual spray so that it does not escape readily and also forms a slight foam blanket around the anodes. It is claimed that up to 99% of the chrome mist is eliminated. The resultant advantages are said to be that health conditions in the plating room are greatly improved, since all chrome fumes are eliminated from the atmosphere; rack carriers in full automatic machines, racks, busbars, and ventilating systems are kept clean, reracking for chrome after nickel is usually avoided, and the savings in chromic acid, labor, and maintenance are reported to more than pay for the No-Cro-Mist. Operation of the bath is not effected by the addition agent, according to the company.

Literature is available by writing to R. O. Hull & Company, Inc., Dept. MF, 1279 West 3rd St., Cleveland 13, Ohio.

Portable AC Glass Electrode pH Meter

National Technical Laboratories, manufacturers of Beckman Instruments, recently announced a portable glass electrode pH Meter which is said

to combine maximum accuracy and versatility with full AC operation. Designated as the Beckman Model H Meter, the instrument can be plugged directly into any standard 110 v. 50/60 cycle AC line, and can be transported

from one location to another or installed permanently.

The instrument covers the full scale of 0 to 14 pH and can also be used for making millivolt readings within the range 0 to ± 410 millivolts. Measurements of pH can be made to an accuracy of 0.03 pH unit, and millivolt readings to 2 millivolts. A neutral position on the switch disconnects the indicating meter from the electrical circuit to avoid excessive swinging of the meter needle during warm-up periods and when changing test samples or electrodes.

A feature of this meter is a built-in temperature compensator dial calibrated 0 to 100 degrees C. which can be set at the temperature of the test sample. This automatically adjusts the measuring current to compensate for the effect of temperature on the EMF of the glass electrode, thus insuring correct pH readings without calculations or reference to pH-temperature charts.

The Model H is equipped with patented internally-shielded Beckman Glass Electrodes with integrally attached shielded leads to eliminate electrostatic interference. Each electrode is permanently sealed and has an immersion end made of special glass. Various types, shapes and sizes of glass electrodes are available for the Model H to meet various operating requirements—high temperature operation, high pH operation in presence of sodium ions, direct immersion in sludges, abrasive earths, etc.

The instrument is compact, measuring 12" x 9½" x 8½" overall, and with a net weight of 14 lbs. It has a power consumption of 35 watts and is supplied complete with electrode support rod, electrode holder, Glass electrode, Calomel electrode, pint of pH 7.00 concentrated buffer, 100 ml saturated KCl solution and 50 ml Pyrex beaker.

Detailed literature on the Beckman Model H pH Meter may be had by writing Beckman Instruments, National Technical Laboratories, Dept. MF, 820 Mission Street, South Pasadena, Cal.

Stanton Abrasive Cement

A new type of abrasive cement has been introduced to the metal finishing field by Stanton Products Co., Dept. MF, 2055 W. Lake St., Chicago, Ill. Said to be more efficient and flexible in use than other graded cement, the

company claims that one grade grips all grains, from grade 60 to 320. The mixture is ready for use for setting up polishing wheels, belts and discs, and for polishing all metals. The cement is packed in cans of 1 quart and 1 to 5 gallons, and in drums of 30 and 55 gallons. Further details on request from the manufacturer.

Buffing Compounds

The Hydro Chemical Co., East Hartford, Conn., has announced a new series of buffing compounds called the Hydro-Buff "500" series designed to decrease buffing operational time on both ferrous and non-ferrous metals. The manufacturer claims that use of these compounds cuts cleaning time of pieces to 30-45 seconds. The compounds are non-inflammable and are soluble in all proportions in the chlorinated hydrocarbons. The manufacturer believes these compounds are well suited for plants equipped for vapor-phase degreasing operations. It is claimed that the retention of these compounds on buffing wheels is good; they cut and color in the same operation, and the film remaining on the piece, before cleaning, will protect against oxidation and staining for long periods of time.

For further information write the Hydro Chemical Co., Dept. M.F.

Bright Cadmium Plating Process

Announcement is made by the Hanson-Van Winkle-Munning Co., Matawan, N. J., of a new and improved bright cadmium plating process, the result of two years of laboratory investigation and commercial testing in the field—the Cadux HS Process.

The manufacturer claims the following advantages of the new process:

1. Increase in brightness of deposit.
2. A higher tolerance for impurities.
3. Higher permissible current densities.
4. Improved covering power and appearance on rough and imperfect surfaces.

Under optimum conditions, the deposits are mirror-bright as they come from the plating solution. A short bright dip may be used in order to compensate for variations of current distribution because of limitations in racking or because of the intricate shape of the article being plated. It also minimizes finger marking during assembly operation.

One of the outstanding features of the new process is its tolerance for impurities. The range of the bath is from 20 to 40 amp/sq. ft. with an optimum current density of 30 to 35 amp/sq. ft. in still plating. With agitation, current densities up to 70 amp/sq. ft. have been employed.

With regard to covering power, work has been done on rough base metal which indicates that a lower grade steel may be used, and still give a finished product which will pass inspection.

A new Technical Instruction Manual has been issued in which formulae are given for the preparation of both still and barrel solutions.

Patch-Type Acid Resisting Flooring

Dyer, Inc., Dept. MF, East Rutherford, N. J., has recently developed a plastic patching compound which is claimed to render any surface highly acid resistant, as well as waterproof. It is applied in one trowel coat only, 1/8" or less in depth preferably, is odorless and therefore can be applied in a closed space. The compound is said to form a surface which withstands trucking and ordinary traffic, sets very rapidly and in a light color which can be painted immediately after drying. It can be used on any surface: wood, cement, or iron.

Explosion-Proof pH Meter

Recently announced by The Macbeth Corp., Dept. MF, 227 W. 17 St., New York 11, N. Y., is a new completely sealed pH meter. Line operated, direct reading, and continuous

indicating, the instrument is designed in accordance with Class I, Group D requirements for use in atmospheres containing gasoline, petroleum, ethyl alcohol, and acetone. The meter is also provided with a connection for operating a recorder at a remote position.

Hand Made Buffs

Development of a hand-made buff, named the Hollycraft Buff, has been announced by Hollycraft Manufacturing Co., 7131 Van Nuys Blvd., Van Nuys, Calif. Originally intended for use only in their own plant to alleviate the wartime shortage of good buffs, the makers claim that the hand-made quality of their product has caught the attention of others in the area who require quality buffs. Distribution of these buffs is still confined to the West Coast area, but the firm plans to expand its operations to cover nationwide distribution early in 1948.

Magnetic Parts Retrievers

M. E. Baker Co., Dept. MF., 143 Sidney St., Cambridge 39, Mass., has announced two new Alnico tank magnets for use in recovering lost steel parts from plating and processing tanks, sorting steel burnishing balls from compound, etc. These magnets are available with or without a 36" rubber covered handle. The smaller

size is capable of lifting about 40 lbs. and the larger one about 100 lbs. Both sizes are claimed to be inexpensive and light in weight.

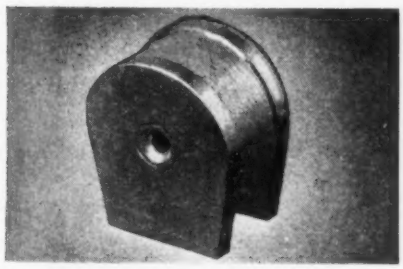
Buffing Equipment

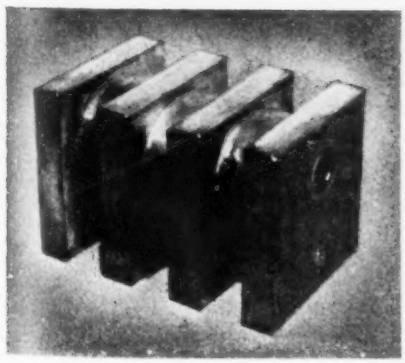
Announcement is made by Baldor Electric Co., 4315 Duncan Ave., St. Louis 10, Mo., of a line of buffing machines designed for heavy duty continuous service, incorporating large, dust-sealed ball bearings, and dynamically balanced armature for smooth operation. Available in either bench or pedestal types, these buffers are equipped with either 1½ h.p. or 3 h.p. motors having a speed of 3440 rpm., and wired for 3 phase operation. Standard equipment includes flanges, nuts, and electrical switches. The manufacturer claims that the price of these buffers is very reasonable and delivery can be made promptly.

Bulletin available on request.

Standard Permanent Magnet Assemblies

General Electric Co., Chemical Dept. MF, Pittsfield, Mass. has announced a line of Alnico permanent magnet holding assemblies, designed to effect economy and efficiency by eliminating the necessity for making each new assembly application to particular





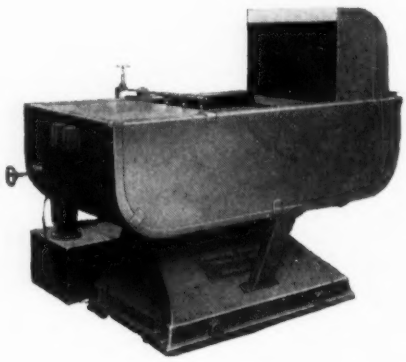
specifications. The new line consists of 5 types in 17 sizes, ranging from a pull of 1½ to 500 lbs. The magnets are said to be specially treated to prevent both internal and external corrosion. Some suggested uses are for

holding magnetic parts for spraying or plating, overhead conveyer work, etc. Illustrated are 2 of the designs, showing the diverse nature of possible applications.

Further information may be obtained by writing to the manufacturer.

Wet-Dry Belt Surfacing Machine

Production Mach. Co., Dept. MF, Greenfield, Mass., has developed a horizontal type wet-dry belt surfacing machine that is entirely enclosed for production work. Available in two sizes for belt widths of 14 and 20 inches, it can be used for either wet or dry operation. The total working area of the larger machine is 20 x 30 inches. A coolant pump and circulation system is included, and both models are available with direct motor drive or Vee Belt drive.



Further information and an illustrated brochure may be obtained by writing the manufacturer.

Business Items

Wise to Manage Division of Buckeye

The *Buckeye Products Company*, Cincinnati, O., announces that *Charles Wise*, secretary, has been placed in charge of the Speedie Buffing and Polishing Composition Division of the Company. Wise will be in charge of both manufacturing and sales activities.

Charles Wise

Wise has been associated with the Buckeye Products Company since 1928. He served twenty-eight months in the army, and was stationed in British Guiana in the Intelligence Office.

Musick Company Polisher Honored

B. C. Wright, foreman polisher at *Musick Plating, Inc.*, St. Louis, Mo., celebrated sixty years of service with the company recently, at a banquet given in his honor and attended by his fellow employees.

He was presented with a gold plaque as a tribute to his record of long and faithful service. Now 78 years of age, Mr. Wright looks forward to many more years at Musick.

An almost incredible fact is Mr. Wright's record of just eighteen working days missed in sixty years.

Lance H. Cooper Elected by International Nickel of Canada

Dr. John F. Thompson, executive vice-president of *The International Nickel Company of Canada, Ltd.*, an-

nounced that *Lance H. Cooper*, of London, England, a member of the staff of *The Mond Nickel Company* for 20 years and one of its delegate directors since 1945, has been elected an assistant secretary and assistant treasurer of The International Nickel Company of Canada, Limited.

Kelite Increases Distribution

As an expanded service to overseas and Latin American offices of U. S. manufacturers and their distributors, *Kelite Products, Inc.*, has recently set up distributing points at Panama City, San Salvador, La Ceiba, Honduras, San Jose, Costa Rica, Curacao, N.W.I., Mexico City and at Sidney, Melbourne, Brisbane, Newcastle, and Adelaide, Australia.

L. C. Sorensen, president of Kelite Products, Inc., left Los Angeles for Europe early in October to arrange for distribution in South Africa, India, and other points as part of the company's program for world-wide availability of its specialized industrial cleaning materials.

Cy Knecht Jr. Joins Father

Cy Knecht, Jr. has recently joined his father at *Daniels Plating Barrel & Supply Co.*, Newark, N. J. Mr. Knecht attended Admiral Farragut Academy, Wesleyan University, and was in the Navy for two years stationed in the Philippine area. Upon his release from the Navy, Mr. Knecht bought the *Franco Metal Polishing Co.* and manufactured buffing compounds. He is now in charge of manufacturing and selling compositions for the Daniels Plating Barrel & Supply Co.

Cy Knecht

Daniels Plating Barrel & Supply Company have recently been appointed New Jersey distributors for *Enthone, Inc.*

Mosher Joins Quaker Chemical

Quaker Chemical Products Corp., Conshohocken, Pa., announces the appointment of *Dr. Hugh H. Mosher* as director of organic research. Dr. Mosher comes to Quaker after fourteen years with the *Onyx Oil & Chemical Company* where he was vice-president in charge of textile research and development.

Dr. Mosher is exceptionally well known in industrial chemistry. He completed his undergraduate and graduate studies at *Leland Stanford University* after which time he served as assistant professor of chemistry at the *University of Nevada*. He next became chief chemist for the *U. S. Testing Company*, then research chemist for *Cheney Brothers Silk Mills*.

It is perhaps in the field of textile processing and finishing that Dr. Mosher has made his greatest contributions. He is a holder of many patents and is active in many scientific organizations, among them, the *American Association of Textile Chemists and Colorists* and the *American Chemical Society*. In the year 1930 he was awarded the AATCC prize for the most valuable contribution to the chemistry of textiles.

Quaker Chemical Research falls into three distinct fields, i.e., Research in Textile Processing, Research in Metal Processing and Dr. Mosher's Depart-

G. E. Mehleck

G. E. Mehleck, sales representative and field engineer in its southeastern territory, embracing Maryland, Virginia, North Carolina and South Carolina, has been transferred to the company's Chicago district office.

Ralph H. Martin has been assigned to Mr. Mehleck's former territory.

Mr. Mehleck, a graduate of Western Reserve University, has been associated with Osborn for six years and has assisted in the development of new uses for brushes and brushing methods in the southern and southeastern areas.

Ralph H. Martin

Mr. Martin, a graduate of Carnegie Institute of Technology with a Bachelor of Science in Chemical Engineering degree, recently served in the U. S. Navy as liaison officer on special development projects for the Bureau of Aeronautics. Prior to that he was associated with the *Westinghouse Electric Co.* in Pittsburgh.

ment of Organic Research. The work done by this department is being applied to many fields in addition to metal and textile.

General Bronze Moves to New Plant

General Bronze Corporation, manufacturers of metal work, have just moved to their new plant at Stewart Ave., Garden City, N. Y. The plant which covers 5½ acres of land and 266,000 square feet of manufacturing and office space will combine all Eastern plants and offices. The company manufactures Alwintite aluminum windows and architectural and ornamental aluminum, bronze, stainless steel and iron.

Osborn Announces Personnel Changes

The *Osborn Manufacturing Company*, of Cleveland, manufacturer of brushes for industry, announces the following changes in its brushing division sales organization:

Oakite New Products Conference

How new products and methods in the field of industrial cleaning and allied procedure are helping to lower production costs is the theme of each of four regional technical-sales conferences being held throughout the country from September through November, 1947 by *Oakite Products, Inc.*

The first conference was held on September 8-10, inclusive, at the Palmer House, Chicago, Ill., launching the series of lectures and round-table discussions on the new materials which have emerged from the Oakite chemical laboratory during the past year. Members of the Central, Chicago and Detroit divisions of the Company participated in a resume of methods of applying the new chemical materials in industry. Special reports on food processing, metals, automotive and railway transportation, milk products will be featured.

Oakite research chemists, service engineers and technical specialists participated with the field service representatives in each of the technical-sales meetings.

New Oakite products highlighted on the conference agenda include an improved-type deodorizing agent, for food and beverage plants; a mold and slime retardant for use in humidifying systems; especially designed detergents for automatic and hand dishwashing; a new balanced cleaner that prepares brass and copper articles for high-lustre bright plating; a self-emulsifying solvent for cleaning metal parts in spray washing machines.

The second in the series of regional conferences was held September 15th, 16th and 17th at the Coronado Hotel, St. Louis, Mo. This meeting included representatives of the Midwestern, Southern and Southwestern divisions of the Oakite organization.

The New York, New England and Philadelphia divisions sponsored the third meeting at the Hotel Commodore in New York on October 6th and concluded October 8th.

The St. Francis Hotel, San Francisco, California is scheduled to be the scene of the fourth conference on November 17th and 18th, in which members of the North and South Pacific divisions will participate.

Oakite Products, Inc., New York, provides more than 70 different specialized materials to American and Canadian industry for a wide range of cleaning and related tasks.

Pennsalt Adds to Sales Staff

The *Pennsylvania Salt Mfg. Co.* has announced that *Charles R. Sorber, Jr.*, of Philadelphia, and *John L. Dawson*, of Cleveland, have joined the sales staff of the Special Chemicals Division and are now undergoing training.

Mr. Sorber is a graduate of Pennsylvania State College and served three years in the Navy in the Pacific. Prior to joining Pennsalt, he was with *Proctor & Schwartz*. Before joining Pennsalt, Mr. Dawson was a salesman for the *W. B. Davis Company* in Cleveland and previously served two years in the Army.

Behr-Manning Announces Service Packaging Plan

Behr-Manning Corp., Troy, N. Y., announces a trade-built repackaging plan — Service Packaging of Coated Abrasives — effective on shipments after January 1948.

Said to have required two and one-half years of study and research into the buying, selling, handling and use habits of its distributors, dealers and consumers, the new Service Packaging program is dscribed by Behr-Manning as ". . . a planned, 'tailored' method of packaging coated abrasives in such proper quantities, weights and invoice values, and in such readily identified containers and wrappers, as to best serve the functional needs and

habits of our distributors, dealers and consumers alike."

Said to provide new economy and convenience in the buying, selling, handling and use of coated abrasives, the plan offers five improvements: decimal quantities instead of ream and quire counts, standard master packages, component resale packages, brand identification by colored labels and line identification by wrapper design.

Electroplating Institute Formed

Announcement has been made of the formation of *The Electroplating Institute of America*, 2020 *W. Liberty Ave., Pittsburgh, Pa.*, for teaching the art and science of electroplating and related subjects.

A full time 9 months course will be given to students who wish to seek employment in the plating field, or who want to establish a plating business of their own. The course will cover basic Chemistry, fundamentals of Electricity and Metallurgy, applied Electrochemical Theory, and Theoretical Electroplating. Parallel to the lecture courses, the students will work in the school's plating shop and chemical laboratory.

A course of four hours a week will also be given for practical platers, designed to round out their knowledge of new solutions and trends in the industry, and to better enable them to evaluate new processes and equipment. Methods of control for pH, throwing power, brightness, chemical composition, and testing of deposits will be thoroughly covered.

The institute's Advisory Board is made up of a group of prominent electroplaters and finishing men in the Pittsburgh area, including *Frank R. Keller, Edwin J. Smith, Wm. J. Hennessey, Edward Washburn, Richard Dimon, Albert Bugel, Joseph Bugel, J. D. Patrick, Arthur F. Kaupe, G. A. Jersey, W. B. Williams,* and *A. K. Mock.* The Institute is a division of the *Pittsburgh School of Plastics*, and it's president is *Mr. Richard J. Zaiden. Dr. Leslie E. Lancy* is serving as *Technical Director.*

Haydon Moves to New Plant

The *Haydon Manufacturing Co., Inc.*, a subsidiary of General Time Instruments Corporation, has moved to a new modern plant at 245 East Elm Street, Torrington, Conn. The company had been operating under a serious handicap in having its manufacturing operations divided between three different plants and it will now be able to consolidate all of its operations under one roof. The company believes the more efficient operation will result in greatly improved customer service.

Illinois Plating Co. Formed in Peoria

Formation of the *Illinois Plating Company*, 501 Abington St., Peoria, Illinois has been announced by *G. Pierce Lyle*, president, and *E. L. Kramer*, secretary.

The new plant has been set up with equipment valued at $25,000 to be expanded to $100,000 when the plant is completed. Industrial and domestic plating in gold, silver, cadmium, nickel, zinc, chromium and other surface treatments are being performed; plant manager is *Frank Neul*, formerly of Chicago.

The new facility is said to be the largest industrial metal plating installation in the state outside of Chicago.

The Electric Products Company Appoints Robert J. Peck

Mr. Gordon J. Berry, vice-president of *The Electric Products Company*, announces the appointment of *Robert J. Peck* as district manager of the company's New York office, 126 Liberty St, New York City.

Robert J. Peck

Mr. Peck will handle all sales and service negotiations in the territory which consists of the New England States, Eastern New York and Pennsylvania, New Jersey, Delaware, Maryland and Virginia.

A graduate of New York University in 1930, Mr. Peck has since then been actively engaged in the selling, engineering and servicing of electrical products. He joined The Electric Products Company May, 1947.

S. Wernick Arrives in U. S.

S. Wernick, president of the *Electrodepositors' Technical Society*, London, England, has arrived in this country

S. Wernick

for a six weeks business trip. Mr. Wernick hopes to renew contacts with many of his colleagues in this country and he may be reached through *Metal Finishing*.

Associations and Societies

AMERICAN ELECTROPATERS' SOCIETY

Newark Branch
Convention Committee

The first regular meeting of the *Convention Committee* of the *Newark Branch* for the *35th annual A. E. S. Convention* which is scheduled to be held at the Ambassador Hotel in Atlantic City, N. J., on June 28, 29, 30, and July 1, 1948, was called to order on September 9, at 8:30 P. M., by General Chairman, *Mr. Horace H. Smith*, at convention headquarters, 35 Fourth St., Newark, N. J.

Under the able leadership of Mr. Smith, the chairmen of the various committees were appointed. Eighteen Newark branch members were present at this meeting. The following members were chosen to head the various committees:

Horace H. Smith, General Chairman.
George Wagner, Finance.
Myron Diggin, Educational Chairman.
George Wagner, Industrial Exhibits Committee.
Louis Donroe, Comm. for Branch Exhibits.
Paul A. Oldam, Program and Entertainment.
John Gumm, Registration.
George Reuter, Banquet.
William F. Bruhns, Publicity.

Mrs. Regina Munning has kindly consented to head the committee to entertain the ladies. As her co-workers she has chosen *Mrs. Catherine Smith*, co-chairman, and *Mrs. Jenny Wagner*, secretary.

During the course of the evening, aspects of the procedures to be followed were discussed. Among these

subjects were the educational program. The subject matter and the speakers chosen for the various subjects will be left to the discretion of the educational committee. The program and the entertainment were also discussed at length. The chairman of the industrial exhibits committee presented several interesting ideas on the handling of the main exhibits. It is the desire of the branch to have a very complete and interesting branch exhibit at this convention and it is hoped that the various branches will be kind enough to give their fullest cooperation to put over this exhibit.

Meeting was adjourned at 11 P. M.

Winter Educational Session

The branch extends to readers of *Metal Finishing* a cordial invitation to attend its annual winter educational session to be held on December 20, 1947, at the Robert Treat Hotel, in Newark, N. J., at 2:30 P. M.

The educational committee is presenting the following pertinent subjects to be discussed by the well qualified speakers as follows:

1. *Dr. F. A. Lowenheim*, Metal & Thermit Corp., Rahway, N. J. Subject: *Electroplaters' Metals of the Future.*
2. *Myron B. Diggin*, Hanson-Van Winkle-Munning Co., Matawan, N. J. Subject: *Periodic Reverse Plating.*
3. *Milton Nadel*, Consolidated Razor Blades, Jersey City, N. J. Subject: *Surface Finishing of Aluminum and Its Alloys.*

The Newark Branch will hold its annual Christmas party following the educational session.

Dinner will be served at 7:30 P. M., followed by entertainment and music.

Authors' Papers for 1948 Convention

Five educational sessions will be held at the *American Electroplaters' Society Convention*, Atlantic City at the *Ambassador Hotel*, June 28 to July 1, inclusive. One of the five sessions will be devoted to the reports of the various A. E. S. research projects.

Following the custom of the past few years, it is planned to devote one or two sessions to group papers, all papers at one of these sessions relating to a general subject. Some of the suggestions under consideration are:

1. Barrel plating.
2. Tumble Methods for Preparing Work for Plating and for Finishing after Plating.
3. Electropolishing (Methods in commercial use).

In addition to papers on the special subjects listed above, papers on miscellaneous subjects are solicited. Prospective authors are urged to submit papers, or signify their intentions of doing so at the earliest possible moment so that the committee can plan the program most effectively. All papers must be submitted in triplicate not later than April 1st and abstracts for inclusion in the Convention Program announcement not later than March 1st. In order to plan a well-balanced educational program, the committee urges American Electroplaters' Society members, branches and non-members to take advantage of this opportunity to present their work before the Society.

New York Branch

The New York Branch has resumed their regular schedule of bi-monthly meetings for the fall and winter seasons at their headquarters in the Hotel Pennsylvania, New York City.

Detroit Branch

The Annual Educational Session and Banquet will be held on Dec. 6, 1947, at the Hotel Statler, Detroit, Mich.

The Session will start at 2 p.m. and will be a symposium on "Plating Plant Engineering." Chairman of the symposium will be *Mr. W. L. Pinner*, Past President of the Supreme Society.

Speakers will include *L. Moye, Engineer, Utley Co.*, on "General Plating Engineering"; *G. L. Nankervis, the G. L. Nankervis Co.*, on "DC Power Transmission and Piping"; *L. C. Borchert, Tech. Manager, Houdaille-Hershey Co.*, on "The Practical Significance of Good Power Transmission"; *V. P. John, Manager Industrial Div. American Blower Co.*, on "Ventilation"; and *G. M. Cole, Chem. Eng., Ternstedt Div. General Motors*, on "Filtration."

Following the Symposium there will be a Dinner Dance and Entertainment. Tickets for this affair are available only from the Secretary, *Mr. F. L. Clifton.*

Rochester Branch

The monthly meeting of the *Rochester Branch* of the *A. E. S.* was held at the Hotel Seneca, Friday, September 19, 1947.

The following officers were elected:
President—*Robert Flint.*
Vice-President *Joseph Hull.*
Secretary—*James Weaver.*
Treasurer—*Fred Wagner.*
Librarian—*Charles Hendershott.*
Board of Managers—*Cecil Thornton, Donald Blum, John Adams, Francis Fougherty, William Tucker.*
1st Vice-President and Steward—*John McGuire.*

It was suggested that the branch have a steward whose duty it would be to introduce new members. This was delegated to Mr. John McGuire, 1st vice-president.

Suggestions were received as to what members would desire in the way of meetings this year and discussion was held pertaining to a Christmas Party with Mr. Raymond Berghold appointed chairman.

Los Angeles Branch

At its October 13 meeting, The Los Angeles Branch unanimously authorized its delegates and/or proxies to vote in favor of the proposed increase of $2.00 per year in Supreme Society dues.

President Howard Woodward appointed a three-man committee to make recommendations regarding the proposed changes in the national constitution. Named to this committee were—*Don Bedwell*, chairman, *Roy Lostetter*, and *Walter Behlendorf.*

Earl Coffin, chairman of the arrangements committee for the 1948 annual educational session, reported that

March 20 had been selected as the date for that affair, with the Los Angeles Breakfast Club as the locale. The program will be divided into morning and afternoon technical sessions, a noon-day luncheon and the annual dinner and ball in the evening.

Coffin also announced that plans are being developed for a Los Angeles Branch "Jamboree", to be staged at a still undecided date in January, for which the entertainment committee will provide a lively program of entertainment as well as nourishment for the inner man.

Two new members were initiated at the October meeting. Guests introduced included the following: *Marlow W. Galbraith* and *Roy Simmons* of Gene's Plating Works; *Joseph E. Stablein*, Hollymade Hardware Co.; *Edward Delamater*, Sundmark Supply Co.; *Truman Stoner*, Chief Products Co.; *Lawrence Jones* and *Wyatt Wood* of Jones and Wood Co.; *Ken W. Jung* and *Vincent Morris* of L. H. Butcher Co.; *George J. MacDonald*, Hallenscheid-MacDonald Co.; *Charles Villarel*, Feldman Co., and *E. L. Sturtevant*, *K. O. Parkman* and *George Bender* of Cadmium Nickel Plating Co.

During the educational session the branch's three delegates to the national convention presented a complete report of their observations and studies on their trip to the convention in Detroit. Those reporting were *Don Bedwell*, superintendent of the *Hallenscheid-MacDonald Co.*; *Jack Raskin*, head of the plating supply department of *L. H. Butcher Co.*; and *Leon Atimon*, proprietor of the *Modern Plating Co., Inglewood, Calif.*

They described new developments in techniques, methods and equipment, in the finishing procedures they had observed during their visits to shops in Stamford, Conn., Newark, N. J., Providence, R. I., Chicago, Detroit and other cities in the middle-west and east.

The reports were so replete with information of interest to the members, that the three speakers were given a spontaneous vote of thanks at the conclusion of their talks.

The general conclusion reached from their reports was that the Southern California plating industry is practically on a par with the Eastern and Middlewestern areas in the matter of shop efficiency and techniques as a whole, but is handicapped to some ex-

tent by the lack of volume, which does not warrant the use of such huge and efficient mass-production installations as they observed in operation at the *Crane Company* plant in Chicago, *General Motors Corporation* in Detroit, and other plants of that magnitude.

Twin City Branch

The Twin City Branch met on Monday, October 6, 1947, for their monthly dinner meeting. There were 38 members and guests present.

Following dinner, *President Leonard* introduced the guests: *Messrs. Dan Karnitz* and *Jack Splane* of *Perfection Manufacturing Company; Ray Lulling* of the *Fixit Shop; Floyd Mickelson* of *General Plating; Paul Hesse* of *Union Brass and Metal Manufacturing Company; Lauren Meredith* of *General Mills, Inc.; Glenn Champlain, Bob Peterson, Jr.*, of *Twin City Chromium Plating*, and *G. Einberger* of *United Chromium, Inc.*

Mr. Ray Krieger, membership chairman, introduced the new member of the Twin City Branch. She is *Miss Frances J. Sains* of *Lewis Metal Plating Company*. Miss Sains has the honor of being the first woman to belong to our branch.

Following the business session, *C. A. Bowman*, branch librarian, introduced the speaker for the meeting. He was *Mr. Joseph Mazia* of *American Chemical Paint Company* who gave a talk and demonstration on *"Electrolytic Polishing and Pickle Polishing."*

NATIONAL ASSOCIATION OF METAL FINISHERS, INC.

Announcement is made of the election of the new members of the Board of Directors of the *National Association of Metal Finishers, Inc.*, 2236 Dime Bldg., Detroit 26, Mich. These directors are as follows:

Albert W. Olson, Industrial Plating Works, Inc., 3674 4th Ave. So., Seattle, Wash.

F. A. Truden, Southern Finishers, Inc., 1000 6th Ave. So., Nashville, Tenn.

John Hilfinger, Hilfinger Corp., 1800 Westwood Ave., Toledo 7, Ohio.

D. J. Griffin, Birminghom Plating Works, 937 North 17th St., Birmingham 4, Ala.

Chas. W. Logan, Logan Platers, Inc., 555 Main St., No. Tonowanda, N. Y.

AMERICAN SOCIETY FOR METALS

Dr. W. A. Pennington, chief chemist and metallurgist of the *Carrier Corporation, Syracuse, N. Y.* was named winner of the *Henry Marion Howe Medal* for 1947. The award is made annually to the author or authors of the technical paper of highest merit published in the annual Transactions of the Society. Dr. Pennington's scientific paper, "*A Mechanism of the Surface Decarburization of Steel*", was published in 1946.

The medal is awarded in memory of Dr. Henry Marion Howe, who was professor of metallurgy at Columbia University for 25 years.

The medal was presented to Dr. Pennington on Thursday, October 23rd, at the annual banquet of the American Society for Metals which is held as a principal event of the *National Metal Congress and Exposition.*

Medal to C. R. Hook

The *American Society for Metals* has announced that *Charles R. Hook* has been elected to receive the Society's Medal for the Advancement of Research for 1947. Mr. Hook, President of the *American Rolling Mill Company*, Middletown, Ohio, was chosen as "one, who, over a period of years, has consistently sponsored metallurgical research or development and by his foresight and his influence in making available financial support has helped substantially to advance the arts and sciences related to metals."

The medal, first awarded in 1943 to *Roy A. Hunt*, president of the *Aluminum Company of America*, has been won in succeeding years by *Robert C. Stanley*, president of the *International Nickel Company; Gerard Swope*, of the *General Electric Company*, and in 1946, by *Dr. Rufus E. Zimmerman*, vice-president, the *United States Steel Corporation* of Delaware.

Award of the medal plaque and citation was made at the annual banquet of the American Society for Metals held in Chicago on October 23rd during the National Metal Congress and Exposition.

Mr. Hook joined the American Rolling Mill Company in 1902, was elected its president in 1930. He is chairman of the board of the Armco International Comporation and member of the board of directors of the Westinghouse Electric Corporation, the C. C. C.

& St. L. Railroad and the Equitable Life Assurance Society of the United States.

Mr. Hook served as president of the National Association of Manufacturers in 1938, and is an honorary vice-president as well as a director of that organization.

Mr. Hook has received honorary degrees from the Michigan School of Mining and Technology, Ohio State University, Oglethorpe University and Stevens Institute of Technology. He is a member of the Corporation of Massachusetts Institute of Technology, a member of the Business Advisory Council of the U. S. Department of Commerce and also seryes as a member of the National Industrial Conference Board.

Mr. Hook has also devoted a large part of his life to cultural and recreational activities, particularly those beneficial to American youth. For many years he has actively participated in the Boy Scouts of America Movement and is a member of the National Council of that organization.

ELECTRODEPOSITORS' TECHNICAL SOCIETY

Third International Conference

A highly successful International Conference was held by the *Electrodepositors' Technical Society* at the Hyde Park Hotel, London, from 17th to 20th September, when more than a dozen different countries were represented among the delegates.

There were all the ingredients for a successful conference; technical papers covering a very wide field, opportunities for their discussion by leading experts, an informative exhibition showing the latest advances, and a generous display of hospitality.

The conference was opened on 17th September by *Sir Robert Pickard*, F.R.S., past president of the *Royal Institute of Chemistry*.

The president of the Society, *Dr. S. Wernick*, in introducing Sir Robert to the crowded assembly, referred to the First International Conference on Electrodeposition, an event unique in world history, which took place in London in 1937, sponsored by the E. T. S. This idea caught the imagination of the *American Electroplaters' Society*, who organized the second conference in New York in 1939. The Council of the E. T. S. had decided that they would organize the Third International Conference as soon after the war as possible, but it had to be postponed owing to difficult current conditions in Great Britain. The conference had been fully justified despite these difficulties by the magnificent response at home and overseas; representatives from America, France, Holland, Belgium, Czechoslovakia, Egypt, Finland, India, Italy, Spain, Switzerland and Sweden were present. Dr. Wernick particularly welcomed their American friends, *Mr. Walter Pinner*, past president of the American Electroplaters' Society; *Dr. A. Brenner* and *Dr. Holden Pray*, representing the *Electrochemical Society*, then read messages wishing the conference success, including that from *Mr. Kenneth N. Huston*, president of the American Electroplaters' Society.

Sir Robert Pickard, in opening the conference, said it was refreshing to an older scientist to come among such progressive applied scientists. The

Electrodepositors' Technical Society was certainly progressive, for, starting from an association with the *Faraday Society*, a group of theoretical physical chemists, it had grown until its publications were now of world-wide fame.

Its first slim volume was now replaced by papers, the result of extensive research, from all over the world. Its success was due first to the energy and enthusiasm of its officers and Council, some of whom had served throughout its whole history; secondly, to the real and original research it had so consistently fostered in papers which were a fusion of the scientific and practical, and thirdly, to the contacts which it provided between those interested in electrodeposition.

Dr. Wernick then presented the E.T.S. Gold Medal, awarded in December, 1946, to *Mr. Samuel Field*, its first member, its first president, and virtually founder of the Society. The medal was awarded for signal services in the field of electrodeposition, and will be awarded in the future at annual or longer intervals.

Mr. Walter L. Pinner, in proposing a vote of thanks to Sir Robert Pickard and to the president, said that he brought the heartiest wishes of the American Electroplaters' Society. He had only left the Executive Board two months ago, and during his term of office he had constantly urged close association between the two societies, even to the point of fusion. *Mr. Van der Graaf*, in seconding the vote, said that he felt that the time had now come to form a Dutch section of the Society, and with the Council's permission he would be prepared to organize it.

There were four sessions of the conference devoted respectively to:

(1) "Electrolytic Polishing"

(2) "Electroplating in Overseas Countries"

(3) "New Electrodeposition Processes"

(4) "The Structure of Electrodeposits"

The session of "*Electrolytic Polishing*" was notable for papers by *Dr. Jacquet* and collaborators, in which the whole field of scientific and industrial applications of this subject was reviewed. There was also a paper which gave a very detailed description of an industrial process for electropolishing and bright plating brass components, in which the latter were not mechanically polished at all.

In the second session, apart from

reviews of foreign electroplating practices, a very interesting account was given of the ambitious program of fundamental research which had been organized and was being implemented by the American Electroplaters' Society.

The third session included an important description of the substitution of nickel-coated cast iron pistons for bronze pistons in a gasoline pump, made in large quantities with economy in raw material and cost, and also better performance. An American paper on the deposition of alloys of tungsten with nickel, cobalt or iron showed that this may well prove to be an important development in the production of surfaces with valuable mechanical properties which might be applied to guns, jet engines and gas turbines.

Allied to the Conference, an exhibition was on view which comprehensively surveyed most of the latest developments in electrodeposition practice. It showed beautiful and impressive examples of electrodeposition applied to engineering as well as metal finishing.

The arrangements of the conference had been organized in great detail by a number of committees, particularly the Reception Committee, and a full round of social functions, works visits, luncheons and a garden party were included. The highlight of the conference was the Conference Banquet, at which speeches were made by *Sir Ernest Fisk*, managing director of *Electrical Musical Instruments; Major L. H. Peter* of the *Westinghouse Brake Company; Mr. W. B. Phillips*, president of the *American Chamber of Commerce* in London, and the president of the Society.

Manufacturers' Literature

Buffing and Polishing Machines

Vanott Machine Corp., 216 Colgate Ave., Buffalo 20, N. Y.

New bulletins just issued by the above firm describe their line of Buffing and Polishing machines of the chucking type, designed to eliminate the variables of hand methods of polishing. These machines can be used in conjunction with your present polishing heads, and provide as many as 8 spindles for indexing the work and presenting it to the polishing wheel. Production rates as high as 800 pcs. per hour are claimed by the maker.

Bulletins may be obtained from the Vanott Machine Corp., at the above address.

Plating, Polishing and Buffing

Frederic B. Stevens, Inc., Dept. MF, Larned & Third Sts., Detroit, Mich. No. 30 *General Catalog* contains over 600 pages, is completely illustrated with photographs, diagrams and charts. A handsome reference volume designed as a complete encyclopedia of metal finishing practice. Each piece of equipment is described in detail, its use fully explained so that the buyer can readily determine which type is better for his work. A limited number of these catalogs are available and requests must be made on company letterheads.

Electroplating Supplies

J. Holland & Sons, Inc., Dept. M.F., 274 South 9th St., Brooklyn 11, N. Y.

Polishing and Electroplating Equipment and Supplies, a four page folder in two colors and with twenty illus-

trations. Each illustration bears a descriptive caption and number for ordering additional data by the coupon on the last page.

Buffs and Polishing Compounds

E. Reed Burns Mfg. Corp., 40-42 Withers St., Brooklyn, N. Y.

Six illustrated bulletins: *Erbco Canvas Polishing Wheels, Aluminite Paste, Emerite, Steelshine, Tripolex,* and *Burnsrouges.* Brief, concise information is given on use of the compounds, physical properties and grades. Samples of Tripolex will be sent on request.

Processing Carriers

Rolock Inc., Dept. M.F., Kings Highway, Fairfield, Conn.

Catalog Br-7, pictures and describes more than 200 custom-built processing carriers designed to handle metal parts through all finishing operations. Carriers are sectionalized under brazing, enameling, quenching, carburizing, lacquering, dipping, pickling, electro-cleaning, degreasing, washing, galvanizing, blackening, plating, anodizing, and dichromating. There are also retorts, muffles, tanks, sinks and specialties as well as a section devoted to corrosion and heat resistant wire cloth.

Combined Buffing and Polishing Wheel

Hanson-Van Winkle-Munning Co., Dept. M.F., Matawan, N. J.

Bulletin SS-100 describes sisalin sections, a combined buffing and polishing wheel, said to be the fastest and best cutting medium for preparing steel surfaces for nickel and chromium plating.

Polishing Wheels and Accessory Products, another new bulletin of the company covers wheels for all metals, made of cotton, canvas, bullneck leather, walrus leather, cemented sheepskin, quilted sheepskin, felt and leather covered wood. Abrasives and glue are also described. Accessory products include automatic electric glue heaters, balancing ways, mandrels and emery troughs.

Aluminum Oxide Abrasive Grain

Simonds Abrasive Co., Dept. M.F., Philadelphia 37, Pa.

Borolon, a four page bulletin designed for a reference notebook describes this abrasive grain. Borolon is a fused crystalline aluminum oxide

abrasive produced in the arc type electric furnace from a mixture of calcined or dehydrated Bauxite, ground petroleum coke and iron borings or fillings. Its chemical composition is approximately 95% aluminum oxide and 5% oxides of titanium, silica and iron.

The bulletin is well presented and includes a description of the chemical properties of the abrasive, a table of grain size suggestions, and an explanation of the four types of Borolon manufactured.

Air Operated Controllers

The Brown Instrument Co., Dept. M.F., a division of Minneapolis-Honeywell Regulator Co., Wayne and Roberts Aves., Philadelphia 44, Pa.

Catalog No. 8905, Air Operated Controllers, a 40-page catalog illustrated with photographs, schematic drawings and diagrams. Control instruments for temperature, pressure, flow, liquid level and humidity are completely described, both in construction and principles of operation. Control accessories are also listed and explained.

Industrial Rubber Footwear

B. F. Goodrich Co., Dept. M.F., Akron, Ohio.

Industrial Rubber Footwear, Catalog section No. 12040, four pages in two colors, describes construction of boots, rubbers, gaiters, work shoes and pacs and outlines their particular functions in industry.

News from California

By Fred A. Herr

MacDermid Opens West Coast Branch

MacDermid Incorporated of Waterbury, Conn., recently announced the opening of the Los Angeles, Calif., office and warehouse. *Mr. G. Stuart Krentel*, former Chicago manager, has

G. Stuart Krentel

been appointed West Coast Manager at 1011 S. Los Angeles Street, Los Angeles 15, Calif. A complete stock of MacDermid cleaning compounds and MacDermid Bright Copper supplies are carried in warehouse stock in Los Angeles for the convenience of West Coast clients. Mr. Krentel received the degree of Master of Science from Michigan State College. He has been associated with the plating industry in production and in sales and service work since 1933. He has had a broad practical background in metal finishing problems which will enable him to be of assistance to metal finishing firms in this new territory.

A recent report prepared by *E. D. Arthur*, domestic trade commissioner, *Los Angeles Chamber of Commerce*, discloses that manufacturing plants in that city increased from 5,600 in 1939 to 7,500 in mid-summer of 1947. During 1945 and 1946 the total of new plants and those making expansions was reported as 3,850, with capital investment estimated at $568,000,000.

From a state-wide standpoint, some interesting figures concerning the huge expansion of the metal industry in California were recently released by the *Research Department* of the *California Chamber of Commerce*. This report submits a partial list of firms, relative investment and the products of the larger new factories engaged in some form of the metal industry. Included are the following products that require metal deposition polishing or other forms of finishing: Metal furniture, chemicals and allied products, iron and steel, and allied products, non-ferrous metal products, electrical machinery, machinery other than electrical, automobiles and automobile equipment, transportation equipment other than automobiles and trucks. The list cities 118 plants, mostly in the Los Angeles and San Francisco areas, newly erected with a capital investment of $92,924,625.

Frank Rushton, who until he was overtaken by illness this past summer, served as West Coast manager for *LaSalco, Inc., of St. Louis*, is reported to be in an improved condition at the Veterans' Hospital in Sawtelle, Calif. LaSalco's West Coast trade now is served by *Harold A. Shepard*, who makes his headquarters at 750 Lamar Road, La Habra, Calif.

Among new plants and expansions

in the Los Angeles area during the past month are:

Minnesota Mining & Mfg. Co. opened a new $750,000 plant in Los Angeles for the manufacture of adhesives, coatings and sealers for use in automotive and aircraft production and general industrial use; *Pacific Abrasive Supply Co., Los Angeles,* plant additions, $15,000.

E. A. Richards, president, of Richards Rack Co., has announced a building enlargement program which will double its manufacturing area at 643 *South Santa Fe Ave., Los Angeles, Calif.* The company specializes in building plating racks of unusual design for efficient production, combining sturdy construction and light weight. Organized early in 1946, the firm is filling the demand in the Southern Calif. area for plating rack construction and service.

Vacu-Blast Co., Inc., manufacturer of the *Vacu-Blaster,* an abrasive metal cleaning device which employs the vacuum principle for removing the residue of cleaning operations, is now completely settled in its new plant at 350 *Peninsula Avenue, San Mateo, Calif.,* some 15 miles south of San Francisco. *L. H. Bishop,* president, reports the company now has considerable more manufacturing area at its disposal than was available at the former plant in nearby Burlingame.

Articles of incorporation were issued in October to the following Southern California firms: *International Rectifier Corp.,* incorporated with a capitalization of $300,000 for dealing in selenium rectifiers, plates and photographic cells in Los Angeles County. Associated in the enterprise are *George F. Folsom, A. S. Gilkberg, Frank Loughran,* all of San Francisco.

L & T Metal Finishing Corp., Los Angeles, organized and incorporated by *C. L. McGaughey* of South Pasadena and *Nelson O. Taylor* and *A. E. Laster* of El Monte, to engage in the manufacture and sale of metals and metal products.